Office of the Auditor General of Canada

Evidence-Gathering Techniques

June 1994

Table of Contents

	Page
Introduction	1
Objectives	1
Sufficient, Appropriate Evidence is Necessary Throughout the Audit, but Particularly in the Examination Phase	2
Needed: A Stronger Link Between Audit Objectives and Data Collection and Analytical Tools	2
Step 1. Clarifying audit project objectives	3
Step 2. Formulating researchable questions/criteria	6
Step 3. Determining what data will answer the questions	7
Step 4. Identifying appropriate sources/types of data	7
Step 5. Planning the collection of data	8
Step 6. Planning the analysis of data	10
Conclusions	10
Sources of further information	13
Appendix A: Tool kit of sources and methods for collecting data about value for money	14
Appendix A1 - Observation/photos/videos	15
Appendix A2 - Literature searches or searching public databases	18
Appendix A3 - Reviewing program/entity databases and files	20
Appendix A4 - Benchmarking	24
Appendix A5 - Surveys	29
Appendix A6 - Interviews	35
Appendix A7 - Focus groups	39
Appendix A8 - Expert opinion	43
Appendix A9 - Reviewing and using the results other studies and audits	46
Appendix B: Tool kit of techniques for information analysis	50
Appendix B1 - Program logic models	51
Appendix B2 - Making comparisons using ratios	56
Appendix B3 - Interpreting data distributions	59
Appendix B4 - Regression analysis	63
Appendix B5 - Benefit-Cost Analysis	68
Appendix B6 - Simulation and modelling	74
Appendix B7 - Content analysis of qualitative data	78
Appendix B8 - Work flow and communications flow analysis	82

Introduction

01. The design of an audit approach needs careful attention, to ensure that our value-for-money (VFM) work is both soundly based and cost conscious.

02. Getting accurate information quickly is important in any audit. It is important in the survey phase, when a small team is trying to put together pieces of a jigsaw puzzle to understand an entity. Getting sufficient, appropriate evidence is crucial in the examination phase, when the Office's credibility depends on it to justify the conclusions in our reports. Evidence may be challenged by the auditee at the reporting phase of the audit. And it may be challenged again in front of the Public Accounts Committee, where Members of Parliament often ask what support we have for our observations.

03. Our mission statement requires us to provide **objective** information. This calls for rigour in our approaches to gathering evidence. The Office's Strategic Framework also aims to increase the quantitative information presented in audit reports. Another aim of the Strategic Framework is to bring audit costs down. This means that we should use sophisticated techniques in some cases but avoid them in others.

04. Public Sector Accounting and Auditing Committee (PSAAC) Auditing Guideline #1 notes that it is important for the auditor to identify the probable nature, sources and availability of audit evidence, including the cost of obtaining it. The time to clarify these matters is as early in the audit as possible, but certainly before the end of the survey, when the survey report and examination plan are being prepared for matters of potential significance. That is what this guidance attempts to do, by introducing more rigor into the design of the audit. By "rigor" we mean more thought, but not necessarily more paper.

Objectives

05. In summary, this guidance has two main objectives:

- to improve the quality of evidence in audit reports; and
- to improve the cost-effectiveness of data collection and analysis.

06. When selecting audit techniques, it is important to have a base of knowledge about what they can and can't do. We should avoid the use of expensive techniques (such as surveys or case studies) without full knowledge of their costs and their limitations. But, equally, we should not depend entirely on common techniques like unstructured interviews just because we have a lot of experience using them. Without a varied tool kit, we might rely too much on the techniques we know — just as a workman carrying a hammer might look for nails to hammer, when perhaps a saw or Swiss army knife would be more appropriate for the task at hand. This guidance describes an approach to selecting appropriate tools, and opens up a tool kit of some of the most useful VFM audit techniques. The appendices give an indication of **when** their use might be appropriate, but does not tell **how** they are used. More detailed information on how to use them can be found in the references provided, or from the FRLs concerned.

Sufficient, Appropriate Evidence is Necessary Throughout the Audit, but Particularly in the Examination Phase

07. The Canadian Institute of Chartered Accountants (CICA) "Research Study on Value-for-Money Audit Evidence" developed a model of the evidence required at six main decision points in a value-for-money audit. Decision point 1 defines the objectives and the scope of the audit. Decision point 2 defines the criteria. The four remaining decision points are in the examination phase of the audit, beginning with examination planning.

08. This guidance concentrates primarily on the examination; additional guidance may be issued later about the planning phase of an audit. However, often the same techniques — for example, direct observation, interviewing, or file review — are used in both the planning and examination phases.

09. There are several reasons for concentrating particularly on evidence requirements in the examination phase. First, the Office's credibility depends on the quality of evidence gathered in the audit examination. Second, gathering either too much or too little evidence could be expensive or risky. Suppose a team ends up in July or August with one example of a potentially significant issue but no idea whether the issue is widespread or not, because they haven't looked for it systematically. There is no time to do so at such a late stage in the audit. So the issue may not be reported in the annual Report. This suggests a failure in audit planning and in the design of the examination.

10. The starting point for the discussion that follows is the time when an audit team has identified matters of potential significance. Their audit worthiness is established; now the team is considering their auditability.

Needed: A Stronger Link Between Audit Objectives and Data Collection and Analytical Tools

11. No clear path leads from a general audit issue, supported by the Report Steering Committee and the audit advisory committee at the survey stage, to specific audit examination projects. There often has to be a compromise between the audit one would like to do, and what can be delivered cost-effectively.

12. Producing a defensible, cost-effective audit is much easier if the auditor knows the audit objectives, the criteria, and how the issues would be audited before starting the examination. But often these matters are unclear, or left deliberately broad, or are subject to change during the examination phase. It is the responsibility of the project leader to clarify the objectives and criteria and the auditability of issues when preparing the examination plan.

13. One way of doing this is to work through the following six steps:

- Clarifying audit project objectives.
- Formulating researchable questions/criteria.

- Determining what data will answer the questions.
- Identifying appropriate sources/types of data.
- Planning the collection of data.
- Planning the analysis of data

14. These steps would be followed in planning the examination for each matter of potential significance. This approach is consistent with the Comprehensive Auditing Manual (CAM), the CICA study and, in fact, any research design. An example of an examination design form, modelled after the one used by the General Auditing Office (GAO), is illustrated in Exhibit 1. A completed example is shown in Exhibit 2, although it should be noted that an auditor doesn't necessarily have to do all the things in this chart.

15. Working through these steps won't necessarily require an elaborate planning form and a lot of time - some projects are quite straightforward and can be planned quickly. Others, however, may require professional advice or pilot projects. By thinking through the design of all projects from start to finish, the auditor can be more certain the audit examination can "deliver the goods", and can catch potential problems of scope and objectives before costly data gathering begins.

16. Each step is discussed separately below, although in practice they are interrelated and iterative.

Step 1. Clarifying audit project objectives

17. Before considering alternative methods of data collection, we first need to clarify what are the most important audit objectives. Are we aiming primarily to identify significant deficiencies, or are we also looking for positive findings? Do we want to provide an assessment for Parliament about whether a program or entity has met certain criteria? Are we hoping to recommend improvements that Parliament or management can make to help the program run better? Are we hoping to recommend savings?

18. These different objectives would require different strategies, and usually different methods of data collection.

19. For example, suppose the audit objective is to assess compliance with legislation, and the entity knows that a problem exists but is likely to argue that it is not widespread or material. In this situation, a constructive audit would try to determine the extent of the problem. This perhaps could be done by designing a sample survey that enabled the auditor to draw conclusions about the population as a whole.

20. On the other hand, what if the entity acknowledged the existence and seriousness of a particular problem at the outset, but was inclined to believe nothing could be done about it? Then the objectives of the project might be expanded to investigate cause and effect relationships in more detail, to see if there really was something, within the control of the entity, that we could

recommend to improve the situation. Analyzing causes and effects usually requires more sophisticated techniques, as shown on the following page.

21. A possible rule of thumb might be: *some qualitative techniques may be useful for identifying problems and investigating their causes and effects, while some quantitative techniques may be useful for determining the extent of problems.* So-called "soft" techniques like interviews and focus groups are often quite effective in the planning phase of an audit for finding a wide range of potential audit issues. Once these are identified, "hard" techniques like surveys or sampling could be used to determine their extent. And if they are found to be widespread, perhaps more in-depth interviews, focus groups, or case studies could be used to investigate possible causes and solutions.

Exhibit 1

Objectives	Questions/ criteria	Data required	Sources of data	Collection techniques	Analysis techniques

Exhibit 2

Objective	Questions/ criteria	Data required	Sources of data	Collection techniques	Analysis techniques
To determine whether the program is administered in compliance with authorities and with due regard to economy.	How accurately does the department assess applications for payments? Compliance criterion is percentage compliance with the Act and Regulations Economy criterion is percentage accuracy in payments Are payments spent by the recipients for the purposes specified in the Act and Regulations?	System weaknesses Number of applications rejected Dollar value of payments made in error Number of applications approved with errors Number of valid applications rejected in error	System description and list of authorities MIS (management information system) Quality control or audit reports, applications or files	Comparison of processing system with authority requirements File review Interviews or questionnaires Data sampling	Flow charting Secondary data analysis Secondary data analysis and content analysis Statistical analysis

Step 2. Formulating researchable questions/criteria

22. The next step in setting the boundaries of an audit project is to try to phrase the questions that need to be answered to achieve the audit objectives.

23. Questions should be clear and specific and include terms that can be defined and measured, and together they should fully address the audit objectives. If objectives can't be translated into action, it may be necessary to return to step 1 and redefine them.

24. The GAO phrases all audit issues as questions. They do this to try to encourage greater precision in the definition of matters of potential significance. GAO identifies three types of enquiry - descriptive, normative, and cause and effect - all of which would appear to have some relevance here too.

25. *Descriptive questions* usually ask, **what is** (or was) the current situation or condition? These types of questions are often appropriate to studies, or to the survey phase of an audit. But descriptive issues are sometimes addressed in our annual Reports as well, for example:

How does the Department manage the dispute resolution process?

How does the Department relate to the communities it serves?

Were alternative program options considered?

26. Such questions often lay the groundwork for normative audit projects, because one needs to know something about how a particular activity is performed before passing judgment on it. They can also set the stage for cause and effect analysis. Or they can stand on their own. For example, many government programs like Employment Insurance have a multitude of direct and indirect effects that are not well known or understood. Perhaps the most useful thing we can do is just describe what some of those effects are, without attempting to quantify or pass judgment on them.

27. *Normative questions* deal with the difference between an observed condition and a criterion. Whereas a descriptive question asks, what is? and stops there, a normative question also asks, **what should be?** and then compares the two conditions. These are the types of questions we have to answer in all our criteria-based audits. Ideally, a normative question would include the criterion that has to be met. For example, if the audit objective was to determine "due" regard for economy or efficiency, at this point the auditor would try to define what that meant: 100 percent accuracy or compliance, or something less?

28. If a variance exists, a normative enquiry does not establish whether the target or the performance is at fault, nor does it determine the cause of the variance and how to remedy it. This would require a cause and effect enquiry.

29. *Cause-and-effect* questions go beyond descriptive and normative questions to examine the impact, extent, or magnitude of changes or variances. Examples might be: Why does the department not follow all the rules in assessing applications for contributions? To what extent does its failure to do so affect program success?

30. Cause-and-effect analysis is the normal approach used in evaluations, and the research design for this sort of work often presents difficult methodological problems, for example, to deal with questions of attribution.

31. Time spent on these first two steps in examination planning will pay off in helping to develop a practical, manageable approach to data collection, and credible conclusions. If the audit objectives are too broad, there may not be a cost-effective way or, indeed, any way to collect the necessary data, and the objectives of the project would have to be renegotiated or scaled down.

Step 3. Determining what data will answer the questions

32. At this point we introduce the word "data" to describe potential sources of information and evidence. Data become information only after they have been analyzed or evaluated (step 6), at which point they are then suitable for use as evidence.

33. Some of the data that are needed to answer audit questions will be obvious, depending on how clearly those questions are formulated. But often there is much more information available than there is time to collect it, or no single source that answers the questions completely. Thus there will be choices to make about what data would provide the best answer.

34. Steps 3 and 4 are very close together. For each question, there should be information available to provide an answer.

If answers are not readily available, we may have to return to steps 1 and 2 to refine the audit objectives and questions.

Step 4. Identifying appropriate sources/types of data

35. Data can be obtained from original/primary sources and from secondary sources. Original data are originated by the auditor, for example, by direct observation. Secondary data are obtained from other sources, such as the audited entity or third parties. Usually there are several possible sources of data, and so choices have to be made based on the accuracy or credibility, the availability and the cost of various sources.

36. Our VFM audit projects have relied heavily on primary sources such as direct observation or open-ended interviews, and on secondary sources such as entity files and studies by internal auditors, evaluators, and consultants. Although these sources can provide useful and perhaps even unique data, locating or tapping into them can often be both expensive and time consuming. And unless samples are well designed, the wealth of material they expose to view will be anecdotal or qualitative data that cannot be easily summarized and reported. For more discussion of the advantages and disadvantages of these and other sources and techniques, see Appendix A.

37. There are four main types of data used as audit evidence: physical, documentary, oral and analytical. In financial auditing, there is generally acknowledged to be a hierarchy of reliability: physical evidence is the most reliable, then documentary, and then oral. But the CICA

Research Study concludes that this may not be so in VFM audits, where oral evidence is particularly important, although the auditor must be cautious about uncorroborated or "hearsay" information.

38. A caveat is in order. Sometimes the only way data can be analyzed or evaluated is by collecting it from several independent sources. Although choices have to be made among data sources, sometimes for greater certainty the auditor will deliberately decide to collect the same data from two or three sources and compare or "triangulate" the results. This might be done with soft or contentious data expected to play a significant role in the final report. Often the softness or the controversy cannot be foreseen at the planning stage, but it may be wise to plan for it just the same.

Step 5. Planning the collection of data

39. Data collection is the most important part of any project. If you collect too little or the wrong data, you will spend an inordinate amount of time later in rework or clearance. If you collect too much, the excess may have to be discarded or not analyzed, for lack of time. Neither of these results is desirable or cost-effective. Thus it is imperative to make the right decisions about data collection. But it is difficult to know where to start, and when to stop.

40. There are many ways to collect data. Some of those most commonly used in audits are discussed in Appendix A, which contains a "Tool Kit": a description of each technique, some examples of use, an indication of advantages and disadvantages, and sources of further information. Other techniques will be added as their use increases in our VFM audits.

41. Exhibit 3 summarizes the main uses of the techniques of data collection described in Appendix A.

42. Quite often, collection and analysis of data can be done together. But before starting to collect and analyze data, it is useful to ask oneself how the information will be used, and what more has to be done to it before it is included in the audit report.

Exhibit 3

Appendix A	**When to use this technique**
A1 Observation/photos/ videos	• To help gain an understanding of the audit entity, particularly when service to the public or inspection/enforcement are major activities. • In the examination phase, to verify the existence of physical assets, tangible results or lack of results of government programs.
A2 Literature searches or searching public databases	• In the survey phase, to develop or update the auditor's working knowledge of a particular subject.
A3 Reviewing program/ entity databases and files	• To help understand the audit entity, when there are accessible, existing data sets. • To generalize from a small sample of observations to the whole population. • To prepare a case history of a potentially important issue. • To supplement or confirm data from interviews and other sources.
A4 Benchmarking	• To stimulate an objective review of critical processes, practices and systems. • To develop criteria and identify potentially better ways of operating. • To present a common target for improvement in the audited organization. • To obtain outside objective data and credible audit evidence. • To lend more credibility to audit recommendations.
A5 Surveys	• To collect concrete or quantitative information from a large number of individuals. • To identify the general frequency of a given event (when a representative sample of a larger population is surveyed).
A6 Interviews	• In the planning phase, to obtain quantitative information that helps to understand the entity and identify potential issues. • In the examination, to obtain unique or specific information that relates to the audit's objectives, to confirm facts, or help develop recommendations.
A7 Focus groups	• In the planning phase, to define and develop problems more fully or test questionnaires or communications tools for the examination. • In the examination phase, to collect qualitative information and to gain a better understanding of the causes and potential solutions to problems identified.
A8 Expert opinion	• When advice is needed about a new or highly technical subject. • When only a professional discipline is qualified to judge whether a criterion is met.
A9 Reviewing and using the results of other studies and audits	• In planning any audit, to identify and/or check out potential matters of significance. • In the examination phase, to support issue (as long as the evidence is validated before it is reported).

Step 6. Planning the analysis of data

43. There are a number of techniques that can be used to analyze and validate data. Some of the main ones that can be applied in VFM audits are summarized and further elaborated in Exhibit 4.

44. One of the most common techniques used in audits is the collection and analysis of secondary data, particularly the analysis of Internal Audit's procedures or working papers, leading to a decision whether or not to rely on its work. Other common sources of secondary data are quality control reports, consultants' studies and program evaluations. For many types of secondary data, it is not possible to obtain working papers or assess the quality of the staff and the environment they work in, the way we do for internal audits and evaluations done by entity staff. The auditor should at least review the study methodology to see whether the six steps in this paper were followed, i.e., the study design, data collection and analysis, and also perform some reasonability check of the conclusions.

45. Quite often we quote departmental statistics or information in audit reports. It is not wise to do this without some "reality check" or audit of the information, no matter how carefully qualified the reference is. Suppose we say, "According to the Estimates, this program has a staff of 2000 person years." The reader may not realize that we do not audit the Estimates and may assume, because of our responsibility for auditing the Government's financial statements, that this is a figure the auditor has verified, when in fact it would be very difficult to do so.

46. The amount and type of analysis depends on the questions being researched. Thus, a straightforward descriptive question may require only a cursory reality check, while the basis for a recommendation would require extensive verification. For example, some of the criteria that need to be applied before a cause-and-effect relationship can be inferred are the following:

- there must be co-variation between the presumed cause and effect (e.g., by regression analysis);
- the presumed cause must occur before the effect; and
- alternative cause and effect explanations have to be ruled out.

Conclusions

47. This paper has proposed an approach to designing, refining and perhaps rethinking the choices that are made in the examination plan for a VFM audit, in order to create a stronger product in the end.

48. Even though time is usually short at the end of the survey phase of audits, there are some clear advantages in refining the purpose of the project and considering a broad range of possible techniques to achieve it before beginning the examination. A well-defined examination strategy will be more powerful and germane than one that has not paid much attention to planning the data collection and analysis carefully. It minimizes cost and time overruns from ad hoc decisions; it minimizes changes in direction during the examination; it reduces the chances that some

promising lines of enquiry will have to be dropped part way through the examination for lack of evidence or lack of time; and it lays a stronger foundation for developing convincing conclusions and recommendations. An ill-designed approach may lead to wasted effort and erroneous conclusions. Even a well designed approach that is not explained clearly in the report may appear to lack methodological rigor and thus affect our credibility.

M121

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Exhibit 4

Appendix B	**When to use this technique**
B1 Program logic models	• In the planning phase, to help understand the audit entity and to help identify key program results and the program systems and operations that produce them.
B2 Making comparisons using ratios	• To compare actual with expected values. • To place a finding in context. • To observe a change over time. • To note the degree to which a criterion is met.
B3 Interpreting data distribution	• To identify the level, spread or shape of the data when this is more important than a single "average" number. • To decide whether a variable performance meets an audit criterion or not. • To interpret probability distributions to assess risk. • To assess whether sample data one representative of the population.
B4 Regression analysis	• To test a relationship that is supposed to hold true. • To identify unusual values or "outliers" that do not fit the regular relationship between two things. • To make predictions or projections for the future based on an observed relationship that has held in the past. • To build models of entity operations.
B5 Benefit-cost analysis	• To obtain assurance that an analysis done by the audit entity meets professional standards. • To compare costs and benefits when both are known or can reasonable be estimated. • To compare costs of alternatives when benefits can be assumed constant.
B6 Simulation and modelling	• To assess the adequacy of models the audit entity uses to make important decisions. • To answer "what if?" questions about the impact of audit issues, observations and recommendations.
B7 Content analysis of qualitative data	• To help identify the program objectives: To do this the auditor may gather information on the program's legislative history . • To describe program activities: Content analysis can be used to provide an objective description of the program's activities by analyzing departmental documentation. • To determine positive or negative program results: Content analysis can be used to synthesize evaluation reports, audit reports, policy papers, academic or independent assessments of program performance, etc. Summarizing the conclusions reached by these various studies can provide a powerful assessment of the impacts and effects of a given program.
B8 Work flow and communications flow analysis	• To gain an understanding of how an organization or system works, particularly when the subject of the audit involves many departments, units, or complicated steps.

49. This refining process may require more time and perhaps more paper than the approach we normally follow now. In a large, complex project, the auditor may even need to test the

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49. This refining process may require more time and perhaps more paper than the approach we normally follow now. In a large, complex project, the auditor may even need to test the

design before proceeding, e.g., by conducting a pilot project. But in smaller, simpler projects the steps proposed above can be done quickly and informally.

The essence is the thinking process, not the documentation of it.

Sources of further information

United States General Accounting Office, Guide on *Designing Evaluations*, GAO/PEMD - 10.1.4: (especially the chart on pages 64-65).

National Audit Office, Guide on *Study Design*.

D.M. Barnes, *Value-for-Money Audit Evidence*, Canadian Institute of Chartered Accountants, Research Study, 1991.

Office of the Comptroller General, handbook on *Program Evaluation Methods*, 1991.

Office of the Auditor General of Canada, CAM Exhibit 1301.1, Section 2501 (general section on Audit Risk, Assurance and Evidence), and Section 3007 (VFM Audit Planning).

Recherche sociale : de la problématique à la collecte des données, sous la direction de Benoît Gauthier, 2^e édition, Presses de l'Université du Québec 1993.

These are general references: Specific references can be found at the end of each Appendix, or by consulting the appropriate FRLs.

Appendix A: Tool kit of sources and methods for collecting data about value for money

A1 — Observation/photos/videos

A2 — Literature searches or searching databases available to the public

A3 — Reviewing program/entity databases and files

A4 — Benchmarking

A5 — Surveys

A6 — Interviews

A7 — Focus groups

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A9 — Reviewing and using the results of other studies and audits

These appendices can help you decide when but not how to use the audit techniques. Contact the appropriate FRL or seek expert advice before trying something complicated.

Appendix A1 - Observation/photos/videos

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Seeing is believing, and direct observation is generally more powerful than evidence from secondary sources. Going into the "field" to observe the audit subject firsthand is thus an effective way to gather evidence. Recording the results of field observation in photos or videos is an efficient way of capturing first-hand evidence for later analysis. Finally, photos and observed examples may also have a powerful impact on the reader of the audit report. In both the planning and the examination phases of audits, observation is perhaps the most useful, and most used, of all techniques.

In the overview or survey, observation of government work in progress helps the auditor understand what is actually happening. Firsthand knowledge makes it easier to workout important issues, and the choices will be more credible to management.

In the examination, direct observation is the best way to establish the existence or condition of physical assets: was something actually purchased with public money? Is it still working? Is it doing what it was supposed to do?

Direct observation can also record the variety of situations and the details of activities that staff perform, as a way of determining whether the activities comply with authorities and are efficient and effective.

Observation can also help the auditor analyze what and how serious the consequences are if criteria are not met, or perhaps that there are no serious consequences!

What is involved in using observation/photos/videos?

Observation usually involves several steps. The first is selecting, watching and recording objects, events or activities that play a significant part in the administration of government programs. The observed conditions can then be compared with criteria and the consequences analyzed.

Examples

There are many examples of how this technique has been used. Direct observation is essential to an understanding of programs providing services to the public, as well as inspection or

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Examples

There are many examples of how this technique has been used. Direct observation is essential to an understanding of programs providing services to the public, as well as inspection or

enforcement functions. For example, the teams auditing customs clearance at airports observed the very long lines of incoming passengers whenever two 747s arrived at the same time. Such peak load problems hindered the effectiveness of inspection, as well as the quality of service. Another example is the observation of dangerous chemicals stored unsafely in a NHW laboratory, illustrating unsafe working conditions for staff, in violation of occupational health and safety regulations. This observation and photos of it are shown in the 1982 Report, pages 364-5.

When to use observation/photos/videos

- To help gain an understanding of the audit entity, particularly when service to the public or inspection/enforcement are major activities
- In the examination phase, to verify the existence of physical assets, tangible results or lack of results of government programs

Grants and contributions programs almost always provide fertile ground for field observation. An example is the 1988 audit of the Canada-Nova Scotia Development Fund, when the audit team had to determine whether $200 million in "infrastructure" projects actually supported offshore oil and gas development as required by the Federal-Provincial Agreement. A review of the files for the 50 projects that were funded turned up some evidence of non-compliance, but the files were thin and raised a lot of question marks. Field visits provided powerful supporting evidence, such as an empty seaport used occasionally to ship timber but not located near any proposed offshore oil or gas development, an empty industrial park, bridges with no discernible connection to offshore oil and gas, and not until eight years later connected to any road. Photos and videos of these projects were released in connection with the tabling of the 1988 Report and dramatically made the point that the terms of the Agreement has not been met.

Strengths and weaknesses

Observation provides only anecdotal evidence unless it is combined with a planned program of data collection. A random walk provides no basis for generalization. Some first-hand observation can be justified in almost every audit, but planning and carrying out field trips to collect representative data can be expensive.

Observation of people is naturally more difficult than observation of physical assets. It requires more care to ensure that the observations are fair, comparable and representative. As with an interview, the observer of an activity must be trained first to know what to look for, and must approach it with an open mind.

Often the best observations of activities are made when the auditor fits unobtrusively into the environment. This may take time and effort for the auditor and others affected, such as program staff and clients. Beware of the effect your presence may have on the activity. On the other hand, there may be limits to the usefulness of evidence obtained without the knowledge of those enforcement functions. For example, the teams auditing customs clearance at airports observed the very long lines of incoming passengers whenever two 747s arrived at the same time. Such peak load problems hindered the effectiveness of inspection, as well as the quality of service. Another example is the observation of dangerous chemicals stored unsafely in a NHW laboratory, illustrating unsafe working conditions for staff, in violation of occupational health and safety regulations. This observation and photos of it are shown in the 1982 Report, pages 364-5.

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Field program staff often relish the chance to explain their particular problems firsthand, especially if they have had some difficulty explaining them to other visitors. In such a situation, staff may be quite pleased to provide documentation or to be photographed in action.

Sources of Further Information

Office of the Auditor General of Canada *Bulletin 84-7*, Photographs and Other Visual Aids. (While aimed at the end use of photographs in the Annual Report, this bulletin also helps explain what makes an effective photograph for evidence purposes. It is always wise to keep the end use in mind.)

Appendix A2 - Literature searches or searching public databases

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

A literature search is a technique which enables the auditor to discover and make the best use of published works which are relevant to the subject of the audit. The results of a literature search can provide general background information or detailed information about particular issues and aspects of the program being audited.

While a literature search can be made at various points in the audit, it should always be done at the commencement of a new audit project. It is also useful to provide an update on the auditor's working knowledge of a particular entity or issue.

What is a literature search?

In the Treasury Board handbook on Program Evaluation Methods, a literature search is described as an examination of two types of documents. The first type consists of general research reports, papers and books in the subject area of the program. From these one may obtain a basic grounding in the fundamental principles, characteristics and concepts that apply to the program or the area in which the program operates. The second type is specific studies in the area, including any past audits or evaluations. These may provide detailed data which could be incorporated into audit criteria, and their use is discussed further in Appendix A9.

Literature searches can be tailored to provide certain types of information. There are three categories of searches, classified by the results they produce. Factual searches provide hard information and its source. Bibliographic searches normally provide a list of publications relevant to the subject matter of the search and sometimes may contain abstracts of works. The third kind of search will produce the complete text of a particular book or article.

Information on any subject may be sought by this method. The library has access to over 450 databases.

When to use literature searches

- **In the survey phase, to develop or update the auditor's working knowledge of a particular subject**

Examples

The Library reports that most audit teams are using literature searches of one kind or another. In the past year, the library has performed 261 literature searches for auditors. For example, our 1993 Chapter on Electronic Filing of Individual Income Tax returns talks about the use of electronic filing in other countries or paragraphs 21.32 and 21.33. Information about use in Australia was obtained from a literature search. Another search for the same audit team turned up very useful information on the underground economy.

Strengths and weaknesses

Literature searches, if carefully done, can provide a lot of very useful information at very low cost. But there is a cost: for the Library to search and retrieve information, for using databases (almost all are commercial) and for the auditor, especially if the search parameters are broad.

Some of the benefits arising from literature searches are:

- past research may suggest hypotheses to be tested or evaluation issues to be examined;
- specific methodological difficulties may be identified and techniques and procedures developed or discovered for coping with them; and
- sources of usable secondary data may be uncovered which lessen the need to collect generally more expensive primary data.

In terms of weaknesses, there is a danger that data gathered from a literature search may not turn out to be relevant or compatible enough with the audit questions being examined. And the accuracy of secondary data is often difficult to determine.

The foregoing points illustrate that the utility of a literature search depends upon the auditor being aware of the limitations of certain data for wholesale incorporation into the audit terms and references. However, on the whole, a literature search is a quick way to access a considerable amount of information for purposes ranging from background understanding of the subject to familiarity with current thinking on the subject.

Sources of further information

Treasury Board of Canada & Comptroller General Handbook on *Program Evaluation Methods*, Section 4.2, 1991.

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Appendix A3 - Reviewing program/entity databases and files

Six steps in audit design

- **Clarifying audit project objectives**
- **Formulating researchable questions/criteria**
- **Determining what data will answer the questions**
- **Identifying appropriate sources/types of data**
- **Planning the collection of data**
- **Planning the analysis of data**

Auditors should always know what types of data or information the audit entity itself collects. In certain circumstances, using such information can:

- increase the auditor's understanding of the entity;
- reduce the cost of the audit;
- reduce the amount of time to complete the audit;
- increase the credibility of audit observations; and
- generate ideas for improving the entity's reporting to Parliament.

Typically, auditors use these types of data and files both in the survey stage (to help identify lines of audit enquiry) and during the examination stage (to help provide sufficient and appropriate audit evidence for an observation).

All departments and agencies have files or records that are routinely collected as part of the administration or management of their programs. Such data generally fall into two categories — administrative and performance.

Some examples of administrative data are the minutes of executive or other important committees, the forms that government program applicants fill out, or routine records kept by departmental staff.

When to review program/ entity databases and files

- **To help understand the audit entity, when there are accessible, existing data sets**
- **To generalize from a small sample of observations to the whole population**
- **To prepare a case history of a potentially important issue**
- **To supplement or confirm data from interviews and other sources**

Program performance data, on the other hand, includes ongoing information on various characteristics of the program. Such information is usually collected for use by departmental officials when they manage the program. Typically, these entity files and data provide information on the economy, efficiency and effectiveness of the program and might include such information as client satisfaction, client service, or measures of efficiency, production impacts, etc.

A key element of any file review is the selection of an appropriate sample. Some of the key considerations in selecting such a sample are:

- whether selected files are representative of the population; and

- how much it costs to access the files. While cost is not an overriding factor, it may be more appropriate to select a large number of easily accessible files than a small number of less accessible files.

For further information on sampling, the auditor should consult a sampling statistician.

The costs of records searches depend on the state of the data. the search method, and what one is looking for. A range of 104 - 504 per record would be reasonable, with large searches tending toward the bottom of the range. For example, one recent search of 45,000 records cost 174 per record.

Examples

Re-analysis of income data. Income tax records collected as part of the administration of the *Income Tax Act* were used by auditors to determine the international financial activities of Canadian taxpayers. The audit issue ("Tax arrangements for foreign affiliates are costing hundreds of millions of dollars in lost tax revenue", par. 2.28, 1992 Report) was being monitored by the audit team as a potential area for further investigation. Although they knew that there was an issue, they were not sure how big an issue it was. A re-analysis of the income tax data files showed that Canadian corporate taxpayers had invested "$92 billion in non-resident companies"

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Use of existing departmental administrative records. In a sequence of DND audits, auditors requested special "computer runs" of DND inventory management systems. Using these runs, the auditors identified $650 million in excess inventory. In another case (1990 Report) the auditors used an existing human resource data bank on rank structure to demonstrate the difficulties the Department would face in the future due to the aging of its staff. In yet another case, the team used data from the military personnel system to determine that militia officers had only a fraction of the operational experience of regular Force officers at the same rank.

Strengths and weaknesses

Reviews of program/entity records and files present several opportunities and limitations. Some of the limitations:

- Data files frequently are inaccessible — they may not be kept centrally, e.g., they may be in the regions, in "central records", "dead storage" or scattered across several people's filing cabinets.
- They may not have been collected for the same purpose as the auditor's and thus may need some modification.
- Administrative rules may change over time, thereby making time-based comparisons difficult.
- Data or information may contain extraneous information of no relevance to the audit.
- Data frequently are "dirty" — that is, they are difficult to access (e.g., they may not all be machine readable), they may be coded differently by different regions or administrative groups, they may not be kept up-to-date, etc.

These limitations are often balanced by some of the following strengths:

- The cost of collecting the data may be low.
- The data may have been collected, maintained and, therefore, understood by the audit entity or client. The client may thus have more confidence in the data, which means the audit findings and conclusions may be more credible and the recommendations perhaps more likely to be implemented.

Sources of further information

Boruch, R.F., Wortman, P.M., Cordray, D.S., and associates, *Reanalysing Program Evaluations - Policies and Practices for Secondary Analysis for Social and Educational Programs.* Jossey Bass, 1981. Jossey Bass Social Science Series. See also, by the same publisher, *Secondary Analysis of Administrative Data Bases,* 1984.

United States General Accounting Office Review Topics in Evaluation, *What do you Mean by Secondary Analysis?*

Carl E. Weisler, Associate Director, Program Evaluation and Methodology Division. (note - this article also explains an extension of the use of departmental data sets to include what is sometimes called meta-analysis.)

Kiecolt & Nathan, *Secondary Analysis of Survey Data in Quantitative Applications in the Social Sciences*. Sage Publications, P.O. Box 5084, Newbury Park, CA 91359, 1984.

Appendix A4 - Benchmarking

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
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Benchmarking is getting a lot of attention in industry but also in government circles. In the overview and survey phases for value-for-money audit, benchmarking can help to establish audit criteria. By learning from other leading organizations in the industry or other governmental jurisdictions it can also help to understand the auditee's strategies, external and internal risks, significant business processes and key factors to its success.

In the examination phase, benchmarking will do the following:

- allow learning in detail from others who follow the processes better than the auditee, or provide evidence that the auditee is indeed a leader in the field;
- permit more penetrating cause/effect analysis. Proper benchmarking requires a detailed study of how the auditee performs a process or handles an issue. Then, by comparing with and assessing against the data obtained from the benchmarking partner(s), it will allow a more thorough analysis of the possible causes and effects;
- provide evidence for our observations and substantiate conclusions; and
- reinforce our recommendations with greater credibility.

What is benchmarking?

Essentially, benchmarking is a process for measuring an organization's methods, processes, procedures, products, and services against those of organizations that consistently distinguish themselves in the same categories of performance.

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When to benchmark

- To stimulate an objective review of critical processes, practices and systems.
- To develop criteria and identify potentially better ways of operating.
- To present a common target for improvement in the audited organization.
- To obtain external data that is considered objective.
- To lend more credibility to audit recommendations.

It may be internal to the organization itself, or go beyond the boundaries of the organization's business or industry. The practices can be adapted to the organization to improve performance.

Benchmarking sounds logical and is quite appealing, but many barriers may exist to doing it well. Some questions should be answered before considering a major investment of audit resources in benchmarking:

- **Is there an existing focus in the audited organization around customers, employees, and continuous improvement of processes?** Your tactics should include educating the auditee to the benchmarking concept and getting a "buy-in."

- **Is benchmarking the right audit strategy for the auditee organization?** Organizations that are open-minded reap strong benefits from benchmarking. Thus, there can be a direct value to the auditee. Even if this is not the case, benchmarking may still have great benefits to the audit. It may provide credible audit evidence or lend more credibility to the audit recommendations to convince the user of the audit report, e.g., Parliament.

- **What should you benchmark?** Successful benchmarking initiatives typically lead to significant redesign of products/services or processes. Therefore, the auditee's strategic or "customer" issues that drive core business processes should be selected for benchmarking.

- **What should you measure?** Obtaining comparative performance data is the raison d'être of benchmarking. However, information on how the results were achieved is just as important. The benchmark measures should link specific business practice measures to customer satisfaction (effectiveness) as well as financial measures.

- **Who should you benchmark?** The ideal benchmarking partner is an organization that has a higher performance level than the auditee's organization in the specific area being benchmarked, and that is willing to share data and discuss practices.

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The names of potential benchmarking partners can be obtained by contacting respective industry and professional associations, experts in the field, benchmarking clearing houses (such as the International Benchmarking Clearinghouse, a service of the American Productivity & Quality Center, Houston, Texas), or by reviewing industry and trade literature.

- **How can you collect data efficiently?** You will need to make a detailed study of how the auditee performs the process to be benchmarked before you embark on a series of field trips. Once you have established internal baseline performance measures, you can learn more efficiently and effectively from existing sources of competitive data. **Do not waste time looking for perfect information.** Instead, focus on collecting sufficient information for process and output improvements.

- **What is the best way to use what you learn from the benchmarking initiative?** After summarizing the findings of the study, you will have to determine the variances between the auditee' s processes and those of the benchmarking partner. You will have to put any gaps into perspective by first considering factors unique to the industry or the organization.

Cost

The American Productivity and Quality Center conducted a survey of the cost of benchmarking studies done by 80 organizations. estimated costs for time, personnel and experts averaged about $75,000. Although the number of individuals involved is higher than we would use on the audits, the average salary and overhead costs used on this calculation are somewhat lower than ours. Details are reported in the September 1993 issue of the periodical Total Quality.

Example

A benchmarking exercise was done as part of the government-wide audit of the internal audit function. Its objectives were the following:

- to identify the state of the art in internal auditing and to create a basis for establishing benchmarks for assessing the internal audit community in the Government of Canada;

- to identify current trends and particular internal audit practices that certain organizations are using successfully and that the audit community of the Government of Canada might find valuable; and

- to make senior government management more aware of internal auditing and the important role that internal auditors should be playing in their organizations.

The audit team felt that this study was especially important because of the changing control environment associated with the federal government's management reform program.

To identify "best practices" in the internal auditing profession, we conducted a study of 40 organizations in the public and private sectors in Canada and the United States. Many of the organizations we visited had gone through, or were undertaking, management and organizational changes similar to those proposed in the government.

The study confirmed that internal audit in the federal government can be improved and that it needs to play an important role in improving government management practices in a time of transition.

The study resulted in a publication entitled *"Internal Auditing in a Changing Management Culture"*, in which we discussed significant areas necessary for a successful internal audit function.

The study allowed the Office to share the findings with the internal audit community, Treasury Board and senior management before the audit report was issued, by distributing the document and by holding a symposium and presentations for the community. Ultimately, it provided the audit with better evidence and more credibility for the audit recommendations.

Strengths and weaknesses

Benchmarking is not a "magic pill", but when it is executed correctly, the process will not only yield best practices but also may promote the kind of thinking by the auditee that generates breakthroughs and supports continuous improvement.

Benchmarking can be an effective tool for an audit team:

- it stimulates an objective review of processes, practices and systems;
- it uncovers and displaying the interconnectedness of different parts of the organization;
- it provides outside objective data on methods of operation;
- it raises questions and identifying potentially better ways of operating;
- it supports recommendations for making changes; and
- it presents a common target for improvement in the audited organization.

A number of mistakes can be made with a benchmarking project:

- The scope may be too broad. Project teams often want to benchmark too many issues and processes or use too many benchmarking partners.
- Too many questions are posed initially. Start with a small list. It will grow as the project unfolds.
- The team is not prepared. Benchmarking takes some skills and preparation, and people have to be committed to the project.

- Some project teams mistake speed for quality. It is better to take the time to do it right.
- Project teams may think it is important to develop lots of statistics to substantiate the benchmarking results. You need the numbers, but focus on the practices that are found.
- The benchmarking partners may be too similar. Do not restrict the initial scope of partners to the auditee's business or industry.
- The team may have a "famous organization" fixation. These may be good in some things, but few are worldclass in everything.

Sources of further information

The Benchmarking Workbook, *Adapting Best Practices for Performance Improvement*, Gregory H. Watson, Productivity Press, Cambridge, Mass.

Strategic Benchmarking, How to Rate Your Company's Performance against the World's Best, Gregory H. Watson, John Wiley and Sons Inc., New York.

The Limits of Benchmarking, Marc Hequet, Training Magazine, Lakewood Publications Inc., February 1993.

Benchmarking or the Search for Industry Best-Practice: A Survey of the Western Australian Public Sector, Frederick A. Frost and Amanda Pringle, Australian Journal of Public Administration, Vol.52 No.1 March 1993.

Benchmarking Best Practices, Jac Fitz-Enz, Canadian Business Review, Winter 1992.

Questions to Answer before Benchmarking, H. Kevin Vaziri, Planning Review, The Planning Forum, January/February 1993.

The Power of Benchmarking, Frederick W. Julien, Internal Auditor, August 1993.

The Government of Canada has a membership in the International Benchmarking Clearing House, a Service of the American Productivity and Quality Center, 123 North Post Oak Lane, Houston, Texas, 77024-7797 USA. Phone (713) 685-4666, Fax (713) 681-5321. Fees for services start with an initial US $5,400 for a "Designated Participant Package".

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Appendix A5 - Surveys

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Surveys are used to gather detailed and specific information from a group of people or organizations. They are particularly useful when one needs to quantify information from a large number of individuals on a specific issue or topic. In most cases, the questionnaire is administered to a group of people who have been carefully selected to be representative of a larger population of individuals. The results of the survey are then interpreted to be representative of the whole population.

Surveys may be useful at both the planning phase and the examination phase of an audit. At the planning phase, surveys may be used to identify issues and to explore the dimensions of an issue. Surveys are also useful at the examination phase of an audit to provide evidence and quantitative information on issues identified in the planning phase.

When questionnaires are administered to a representative sample of a larger population, they can be used to identify the general frequency of a given event. In some audits, a given problem is identified in a small number of selected cases and there is an interest in knowing the frequency of this problem in the population of all cases. When this information cannot be gained from files and administrative records, a survey using a questionnaire may be required.

What is involved in carrying out a survey?

There are a wide range of survey techniques available. The most commonly used are mail, telephone and in-person interviews. The choice of technique will depend on the information that must be collected, from whom, and how it is going to be used. The advantages and limitations of the different types of surveys are explored further under Strengths and Weaknesses.

When to use surveys

- To collect concrete or quantitative information from a large number of individuals.
- To identify the general frequency of a given event (when a representative sample of a larger population is surveyed).

Regardless of the type of survey selected, there are a number of steps that must be carried out in its design and conduct.

An overview of the survey process

Preliminary research	Select who to survey	Design the survey document	Analyze the results
• Decide what information is to be collected • Decide who to collect the information from	• Identify the survey population • Select the method of sampling • Select the sample size	• Decide on the structure and content of the questionnaire • Choose question format • Word questions • Pretest	• Prepare the survey responses for analysis • Analyze the survey responses

Preliminary research. A successful survey asks the right people the right questions in the right way. To be able to do this, you need to have a good understanding of the survey subject and of the people or organizations that you will be surveying. Focus groups and in-depth interviews can be used to gather information in preparation for drafting a questionnaire and selecting a sample. The choice of method will depend on the type of information the survey will collect. For example, if you are surveying an audited body for technical information, in-depth interviews with key staff members will be the most appropriate method. On the other hand, if you are surveying the public, focus group discussions are more appropriate to explore the range of issues.

Select who to survey. The sample frame is the set of people or organizations that may be selected for the survey. One design issue is how well the sample frame corresponds to the population being studied. The details of the sample design (e.g., the size of the sample and the specific procedures to be used to select the sample) will influence how closely the sample approximates the characteristics of the whole population.

In some cases, individuals in the population to be surveyed can be identified easily (e.g., through client lists, pay-rolls, etc.). In other cases, the target population cannot be identified through lists (e.g., members of the public who use a certain office). In this case, you may build the sampling design around the information that you do have, such as expected usage rates and number of locations. If you know little about the population to be surveyed, interviews and pilot surveys can be used to gather more information.

There are a number of different types of sampling techniques that can be used:

- Simple random sampling is the basic method of random sampling. Each member of the population has an equal chance of selection.

- Stratified sampling ensures that different sub-groups of the population are represented. For example, stratified sampling may be used if it is important to

Appendix A5 - Surveys

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There are a number of different types of sampling techniques that can be used:

- Simple random sampling is the basic method of random sampling. Each member of the population has an equal chance of selection.
- Stratified sampling ensures that different sub-groups of the population are represented. For example, stratified sampling may be used if it is important to

include people from different regions of Canada or different-sized organizations. The population is organized into strata and a small random sample is selected from each stratum.

- Cluster sampling is often used because it is quicker, easier and cheaper than other methods. The population is subdivided into clusters of individuals. For example, if individuals' records are located at regional offices, the regional offices can be considered clusters and a simple random sample of regional offices can be surveyed. One of the limitations of this method is a greater likelihood of sampling error.

The next important consideration is to ensure that the sample is of sufficient size to assure precision and confidence in the findings. Contrary to what is sometimes believed, the most appropriate sample size has nothing to do with the size of the population of interest. For example, if there is no variability in the population (e.g., no errors with respect to a certain data element), a sample of one would allow you to draw conclusions about the population. To calculate the appropriate sample size, you must determine the standard error of the estimate, the desired level of confidence and the population variance.

Design the survey document. The questionnaire should be prefaced by an introduction that tells the respondents about the purpose of the survey, how and why the respondents were selected, how the results will be used, the extent to which anonymity will be assured, deadlines and a contact name and telephone number. Guidance on how to complete the survey should also be provided. For mail surveys, the layout of the questionnaire is also important. The questionnaire should be easy to read, follow and answer.

A questionnaire is composed of a structured set of questions. The questions can be open ended or closed ended. Open-ended questions allow respondents to reply freely, in their own words. They are used to collect qualitative information such as ideas, in-depth views and opinions. Unlike closed-ended questions, they require respondents to rely solely on their knowledge or memory. Closed-ended questions, those that require respondents to select a specific category or rating to indicate their answers, are used to collect information in a standard form from all respondents. Most questionnaires are composed of a mix of question types.

The questionnaire should be pretested. The objective of the pretest is to:

- ensure that there are no questions that are misunderstood or difficult or to answer;
- determine whether the order and flow of the questions is appropriate; and
- detect whether any questions are missing.

Analyze the results. Small surveys can be analyzed manually. However, most surveys are large and need to be analyzed by computer. Software packages that can be used to analyze survey data include SPSS, SAS and Lotus.

As the completed questionnaires are received, they should be checked to ensure that the respondents have answered all of the appropriate questions and that there are no unexpected answers suggesting that respondents misinterpreted questions.

Quality checklist for designing a survey

In summary, there are a number of questions that must be asked when designing a survey:

- Are there clear objectives for the survey?
- Have the survey respondents been adequately identified?
- Will the survey instrument provide the needed information?
- Have ethical concerns been addressed adequately?
- Has the audit team established procedures to ensure adequate administration of the survey questionnaire?
- Is there an adequate analysis plan that indicates clearly how responses will be interpreted and summarized to provide the required supporting statements?
- Has the team consulted the *Privacy Act* co-ordinator about the implications of the *Privacy Act* for the survey (e.g., whether a Personal Information Bank should be created)?

Examples

In the audit of human resources management of the Yukon Territorial Government (YTG), a survey of YTG employees was conducted. The purpose of the survey was to supplement findings and perceptions from the overall assessment and from the first two projects selected for detailed examination. Preliminary interviews had identified concerns, issues and problems possibly related to poor practices in managing people. The survey was then designed to gather information on employees' perceptions about the degree to which they were empowered to do their jobs, the quality of direction/supervision they received, and the degree to which they were satisfied with certain aspects of their work.

One of the general observations of the audit was that:

"... we also believe that the knowledge, experience and skills of the YTG work force are not being used to their potential." (p. 10)

This observation was based on the survey as well as on other evidence gathered during the study.

In the audit of Senate administration, a mail survey of Senators in office was conducted for corroborative purposes. Forty-four percent of Senators responded to the survey. The report states that the results represent only the views of the Senators who responded. However, the report also noted that the respondents were representative of the regions of the country and of political parties.

The survey findings were used to support a number of main observations and recommendations. For example, the 1991 audit report recommended that:

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"The Senate should periodically publish, for each Senator, information on all Senate-funded travel." (p. 15)

The recommendation was supported by a number of different methodologies, one of which was the mail survey of Senators. Of the Senators responding to the survey question, 61 percent favoured greater disclosure of travel expenses on behalf of parliamentary associations and the Exchanges and Protocol Directorate. Forty-two percent of Senators participating in the survey favoured publishing dates and destinations of all Senate travel and 45 percent favoured disclosing costs and the names of the people taking the trips.

Strengths and weaknesses

Each survey technique - mail, telephone and in-person - has strengths and weaknesses. These must be considered in selecting the most appropriate methodology for each situation. The table below summarizes strengths and weaknesses for each type of survey.

Type of survey	Strengths	Weaknesses
Mail	• Easy to present questions requiring visual aids. • Respondent does not have to share answers with interviewer. • Generally low cost. • Access to geographically dispersed population. • Respondent has time to give thoughtful answers, look up records, etc.	• Low response rate. • Needs good reading and writing skills by respondents. • Little quality control over answering all questions. • Long data collection period. • Must have complete lists with current addresses.
Telephone	• Lower cost than in-person interviews. • Shorter data collection period. • Better response rate than by mail. • Can be conducted from one central location.	• Cannot reach people without telephones. • Must have complete lists with current telephone numbers.
In-person Interviews	• High response rate. • Can probe, ask complex questions. • Longer interviews can be conducted.	• More costly than other two methods. • Need trained staff of interviewers geographically near the sample. • Longer data collection period.

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Sources of further information

- Floyd J. Fowler, Jr., *Survey Research Methods*, 2nd Edition. Sage Publications, Newbury Park, 1993.

- United States General Accounting Office, GAO/PEMD - 10.1.5, *Using Structured Interviewing Techniques*, 1991.

- United States General Accounting Office, GAO/PEMD - 10.1.6, *Using Statistical Sampling*, 1992.

- United States General Accounting Office, GAO/PEMD - 10.1.7, *Developing and Using Questionnaires*, 1992.

Appendix A6 - Interviews

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Individual interviews are used to some degree in all audits. In the planning phase, they can be used to obtain documents, opinions and ideas that help the auditor to understand the entity and to identify potential issues. In the examination phase, they can be used to obtain data or documents that relate to the audit's objectives; to confirm facts and corroborate data from other sources; or to explore potential recommendations. Interviews are often an essential part of other data collection or analysis techniques such as flowcharting, cost-benefit analysis, and surveys.

Individual interviews are particularly useful when there is a need to ask "open-ended" questions and obtain detailed explanations, impressions and opinions (that is, qualitative information). They cannot provide quantitative evidence, and a number of individual interviews are not a substitute for a survey. Appendix A5 - Surveys - covers the situation where the same questions must be asked in the same way to a representative sample of a population. Structured interviews are quite different from individual interviews because the data from them can be summed together or quantified. (The data from a number of individual interviews can also be analyzed, for example using content analysis).

While individual interviews are used frequently as an introductory data collection instrument, problems in confirming what is said can reduce their evidential value. A single interview by itself provides quite weak evidence. Usually it would have to be confirmed by other independent sources such as documents, observations, or other interviews.

When to use interviews

- In the planning phase, to obtain documents, opinions or ideas that help the auditor understand the entity and identify potential issues.
- In the examination, to obtain documents, opinions and ideas that relate to the audit's objectives, to confirm facts and corroborate data from other sources, or to explore potential recommendations.

What type of interview is appropriate?

An interview is a question and answer session to elicit specific information. Unlike a casual conversation, it has specific objectives; and at least an outline of the questions should be prepared in advance. The types of questions (open-ended or closed) determine the amount of freedom both parties have to explore the subjects. Generally the questions in a structured interview have a specified wording and are asked in a set order. The individual interview allows the interviewer to probe and change direction and emphasis, unlike the structured interview which seeks the same information from many people. But the difference is one of degree, because open-ended questions can be added to surveys.

Most interviews involve the same basic steps: planning and preparing the questions; asking the questions; recording and confirming what is said; and analyzing and corroborating what is said. In planning the interview, it is important to determine the minimum data you want to obtain. If simple information must be obtained from many people or people in several geographic locations, and if it is not essential to observe their demeanor, then consideration should be given to telephone interviews which are usually cheaper than face to face. Some individuals also prefer the greater anonymity of talking on the telephone instead of a personal interview. Others may be nervous about auditors and can be put more at ease by a personal interview than by a phone call.

Complex subjects may be dealt with more easily if there are two interviewers, perhaps an auditor and a subject matter or technical expert. Having two interviewers can also help in asking and recording the answers to significant or potentially controversial questions. Such subjects are not usually appropriate for telephone interviews.

There are many choices in recording and confirming data: for example, by the interviewer(s) taking notes, by audio or video recording (Police now make extensive use of videorecording in interviews, but this should be approached with great caution and only done with permission), by the interviewer summarizing the main points at the end of the interview, by confirmation afterwards, or by obtaining information under oath.

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Getting evidence out of interviews

The interview process is like a funnel, with a lot of data going in the top and a much smaller amount of information or evidence coming out the bottom. Some of what is lost is useful and some not. Here are some points to remember if you want to get the most out of your interviews:

- Not everything said by the respondent is heard by the interviewer.
- Not everything heard by the interviewer is understood.
- Not everything understood by the interviewer will be remembered or written down.
- Not everything recorded will be confirmed by the respondent.
- Not everything the respondent believes can be corroborated by independent source.

Cost

In estimating the cost of interviews, a good rule of thumb to use is to double the actual interview time for preparation and for recording the results. To estimate any less time would risk losing some of the information value from the interviews. The cost could, however, be much more than this, especially when it takes a lot of effort to analyze the results. Some organizations use the figure of 3 interviews per day for estimating purposes.

Strengths and weaknesses

Compared to structured interviews or surveys and other techniques, individual interviews are flexible; can be used to probe thoughts, perceptions, feelings; and they can be adapted to any situation. They sometimes produce spontaneous responses and unexpected information, which can be both an advantage and a disadvantage. A compensating disadvantage is the greater danger of bias or leading questions asked on the spur of the moment.

Although individual interviews usually involve less advance preparation than structured interviews or surveys, on the whole they are more labour intensive. But the response rate is high and obtained more quickly.

In obtaining examination phase evidence, there are many reasons why interviews could produce inaccurate information: for example, if the memory of either party is faulty; if the respondent does not know the answer to a question but takes a wild guess anyway; if questions are not well formulated or misunderstood; or if the answers are deliberately misleading. For many reasons,

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One danger associated with individual interviews is going off on a tangent or straying into unnecessary details. Another is being distracted by the interviewee's objectives rather than your own. Sometimes an unproductive line of enquiry can be terminated by summarizing what you have heard and thanking the interviewee for their time. If not, it is useful to have an escape strategy in case the subject takes advantage of the occasion to bend your ear about other matters.

Finally, interview evidence is sometimes hard to confirm. Some suggestions: summarize at end; two interviewees independently summarize what they hear; send written record to interviewee for confirmation. If only brief notes are taken during the interview, they should be written up as soon as possible afterwards as a formal working paper.

Sources of further information

Gordon, Raymond L, *Interviewing: Strategy, Techniques and Tactics*, The Dorsey Press, Homewood Illinois, 1975, especially Chapters 1 and 2, which have some realistic examples illustrating common interviewing problems.

General Accountants Office *Policy/Procedures Manual*, Chapter 10.4 and Appendix I.

Harmeyer, W.James, Golen, Steven P., Sumners, Glenn E., *Conducting Internal Audit Interviews*, Institute of Internal Auditors Inc., Altamonte Springs, Florida, 1984.

Office of the Auditor General of Canada - Professional Development, Course in Interviewing Techniques.

Audit Interview Techniques; Improving Your Skills. 45 minute video by the Institute of Internal Auditors, Florida. (Our Self Learning Centre has other videos on how to carry out interviews.)

Appendix A7 - Focus groups

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
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A focus group is a qualitative group technique that can serve any of a wide variety of purposes in an audit. Focus groups are particularly useful for examining issues that are essentially qualitative in nature, and that are not easily explored through traditional audit methodologies.

The purpose of a focus group is usually to explore attitudes and beliefs, perceptions, problems, or to search for solutions and causes. Focus groups are used typically in the following ways: exploratory (e.g., defining problems more fully, or generating new ideas), stimulus/exposure (e.g., learning the vocabulary and issues of a population segment, testing a questionnaire or communication tool) and verification/validation (e.g., double checking findings from other research, confirming and exploring new issues coming from earlier research).

In using focus groups, it is important to clarify the purpose at the outset. At the examination phase, focus groups can assist in quickly confirming, or gaining a detailed understanding of, complex qualitative issues such as poor employee morale or problems with client satisfaction. Focus groups should not be used as vague forums to "fish" for issues. Focus groups can also help in the planning of other data collection approaches. Language used by participants in a focus group can guide the design and development of survey questionnaires. In some cases, focus groups have been used for direct review of questionnaires prior to their use. This helps to ensure that respondents will interpret questions in a similar fashion and that the language used is appropriate. It also enables the auditor to gather more complex qualitative information that might be collected especially through a closed-ended questionnaire.

At the examination phase of an audit, focus groups have been used to: verify understanding of the audit entity; validate findings from other sources; analyze causes; search for and develop solutions; and provide information on the impacts of findings.

In most cases focus groups are used in combination with other data collection approaches in an audit.

What are focus groups?

Focus groups are a qualitative research technique. A focus group brings approximately 6 to 12 participants together for a discussion in an informal setting. There is a risk with smaller groups that one or two participants will dominate the discussion, while larger groups are difficult to manage. Participants are usually selected because they have a certain characteristic related to the research topic.

When to use focus groups

- **In the planning phase, to define and develop problems more fully or test questionnaires or communications tools for the examination.**
- **In the examination phase, to collect qualitative information and to gain a better understanding of the causes and potential solutions to problems identified.**

The focus group session typically lasts from 90 to 180 minutes and uses a trained moderator. The role of the focus group moderator is to encourage interaction among participants and to keep the discussion flowing and on topic. The discussion is usually focussed on a specific topic of interest and a "moderator's guide" is used to structure the discussion. A focus group guide provides an agenda or an outline of the topics to be addressed. However, the purpose of the guide is to stimulate the discussion, not to direct the group rigidly.

Focus groups are often conducted in a special facility equipped with an observation room behind a one-way mirror, and are frequently audio or video recorded to provide a permanent record of the discussion. Observers watch the session to gain a better understanding of the views of participants. However, in some situations recording of the session or the presence of observers may inhibit discussion. In such cases, a note taker is needed, as the facilitator cannot effectively encourage discussion and record notes at the same time.

It is important to gain agreement at the outset on the confidentiality of information collected through the focus group. This should be agreed upon by the auditors, management and participants. A frank and open discussion, requires an atmosphere of trust.

There are a number of variations of the group interviewing technique, such as nominal groups. Nominal groups differ from focus groups in that they work to identify consensus and agreed-upon solutions. Each member of the group is interviewed individually or may complete a questionnaire. The responses are then summarized and distributed to the group and individual members are asked for a second round of responses. In many cases, this second round is conducted as a group session rather than on an individual basis. Participants are asked to explain or revise their responses based on the information presented.

In the nominal group, participants can hear the answers of the other group members but are not permitted to interact spontaneously. Although the opportunity for group synergy is diminished in a nominal group, there are occasions when it is more appropriate than a focus group. For example, in some situations individual group members may be reluctant or too intimidated to respond (e.g., a group that includes supervisors and subordinates or a group where one member is

that one or two participants will dominate the discussion, while larger groups are difficult to manage. Participants are usually selected because they have a certain characteristic related to the research topic.

When to use focus groups

- **In the planning phase, to define and develop problems more fully or test questionnaires or communications tools for the examination.**
- **In the examination phase, to collect qualitative information and to gain a better understanding of the causes and potential solutions to problems identified.**

The focus group session typically lasts from 90 to 180 minutes and uses a trained moderator. The role of the focus group moderator is to encourage interaction among participants and to keep the discussion flowing and on topic. The discussion is usually focussed on a specific topic of interest and a "moderator's guide" is used to structure the discussion. A focus group guide provides an agenda or an outline of the topics to be addressed. However, the purpose of the guide is to stimulate the discussion, not to direct the group rigidly.

Focus groups are often conducted in a special facility equipped with an observation room behind a one-way mirror, and are frequently audio or video recorded to provide a permanent record of the discussion. Observers watch the session to gain a better understanding of the views of participants. However, in some situations recording of the session or the presence of observers may inhibit discussion. In such cases, a note taker is needed, as the facilitator cannot effectively encourage discussion and record notes at the same time.

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In the nominal group, participants can hear the answers of the other group members but are not permitted to interact spontaneously. Although the opportunity for group synergy is diminished in a nominal group, there are occasions when it is more appropriate than a focus group. For example, in some situations individual group members may be reluctant or too intimidated to respond (e.g., a group that includes supervisors and subordinates or a group where one member is a recognized expert). Nominal groups can also be used when there is a high level of conflict or disagreement among members.

Cost

Although costs vary, it would not be out of line to estimate the cost of one focus group at between $3,000-$5,000. Costs at the higher end of the range would include more preparation, more people, and perhaps room rental.

Example

Focus groups have been used in several audits of human resources management. In the audit of the Translation Bureau, focus groups were conducted in both the survey and the examination phases. In the first stage, focus groups were conducted with employees to gain a better understanding of the context and work environment. The Bureau had undergone several major changes, including staff cutbacks and increasing use of contracting out. During initial interviews in the survey phase of the audit, several managers and staff had complained that staff morale was low. A focus group was conducted with employees to explore these concerns. The information thus gained guided the development of a consultation questionnaire, which was used in the examination phase. The language and terminology used by participants in the focus group were incorporated in the design of the consultation document. In addition because of the understanding of the context gained through the focus group, the team was able to formulate more relevant and specific questions than would have been developed without using focus groups.

Later in the examination, sessions with nine nominal groups were conducted. These groups were structured to involve fairly homogenous groups of employees, ensuring that no participants in a given group had a supervisory or subordinate relationship. At the beginning of the session, participants were given a grid of factors and asked to identify which factors were the most positive and most negative in relation to the work climate. Participants then discussed their responses and explained their viewpoints during the focus groups. The responses were analyzed and provided some quantitative information. Following these focus groups, a third round of consultation was conducted. All employees were sent a questionnaire for completion. This quantitative information was used to provide further corroboration of the focus group findings.

A main conclusion of the 1991 audit report on the Translation Bureau was as follows:

"Our consultation with employees of the Translation Bureau indicates that the prevailing work climate is poor. Employees have clearly identified negative effects contracting out has on their work, but they are more concerned by the way contracting out is managed than by its use."(p.478)

The main evidence used in the report to support the finding was based on the quantitative survey results. However, the focus groups were critical both in developing the understanding and importance of the work climate as an audit issue and in designing the grid and the questionnaire.

Although the example describes the use of focus groups to explore human resources issues, focus groups can be used in a wide variety of situations, including examinations of quality of service to the public or to clients of government programs.

Strengths and weaknesses

The key strengths of focus groups are the spontaneity and depth of the discussion. Focus groups encourage better cross-fertilization of ideas and opinions among group members than individual interviews. Participants are encouraged to voice opposing opinions and to discuss issues from different points of view. Also, focus groups can be observed personally.

Focus groups provide information from a group of people much more quickly and at a lower cost than if each person were interviewed individually. In addition, participants are able to expand and refine their opinions through interaction with other group members. Snowballing can occur when a comment, sometimes random, by one member triggers an idea or similar feelings in other participants. The idea may then spread through the group, changing and developing as it goes. In addition, the security of being in a group encourages some members to speak out when they would not have otherwise. Respondents in individual interviews may not be willing to express their views for fear of having to defend them or of appearing "different". In a group situation, individuals may find that their views are not so different from those of their peers and they may be more open. The focus is on the group and not on the individual.

Although focus groups offer a number of important strengths, there are also a number of associated weaknesses or limitations. Focus group results cannot be projected to the population at large. They involve a limited number of participants and are usually selected in a non-random fashion. The sessions last several hours and take place at a central location. Securing co-operation from a random sample is difficult. Those who attend a focus group session and actively participate may be different in many respects from those who do not. Both non-participation and non-response can present sources of serious error. Regardless of how many groups are conducted, focus groups are qualitative, not quantitative tools.

One of the most difficult problems with the social environment of the focus group is the desire on the part of participants to please the moderator. Group members may say what they think that the moderator wants to hear. Participants in a group setting may also be reluctant to admit that they do not know about a subject, and so may improvise a response. Also, because a focus group is a social situation, there can be strong pressure on individual participants to conform to the group opinions. What may appear to be a unanimous group attitude may be more reflective of social compliance than individual choice.

Sources of further information

David W. Stewart and Prem Shamdasani, *Focus Groups: Theory and Practice*. Sage Publications, Newbury Park, 1990.

Richard Krueger, *Focus Groups: A Practical Guide for Applied Research*. Sage Publications, Newbury Park, 1988.

National Audit Office, *Qualitative Techniques: Their Practical Uses in VFM Audit*, 1993

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Appendix A8 - Expert opinion

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Most audits use professionals and experts as part of the audit team, on the advisory committee, or for consulting advice. Here we are focussing on consultants or experts who are not members of an audit team or audit advisory committee, but who are asked to provide answers to specific audit questions. The distinguishing feature of this sort of expert opinion is that, generally, the experts' considered conclusions, and not the way they arrive at them, will be the main source of evidence supporting an observation. (They likely will have their own professional standards and procedures they must follow in order to give an opinion.)

Expert opinion is often sought in the survey phase when auditors encounter new or highly technical subjects or they can be used in the examination phase. In some cases, professional qualifications are recognized as essential in order to make judgments about whether criteria met e.g. lawyers in interpreting laws, or actuaries in interpreting the financial viability of insurance a person plans. Opinions from recognized experts can be used as the primary source of evidence in situations that are inherently subjective or difficult to quantify. Or they can be used as back-up when other evidence is soft or qualitative or when new audit procedures are being tried out for the first time.

What is expert opinion?

Experts are persons who have recognized skills or knowledge in particular fields. They could have an expert knowledge of an entity or its business, a particular issue, or a particular research technique. Their standing will depend, first, on their qualifications and experience but also on the currency of their knowledge and their degree of involvement in the field. When several experts are consulted, even if they disagree, their opinions can sometimes be summarized in a systematic way, and the results can add credibility to audit reports so long as they are properly used.

When to seek expert opinion

- When advice is needed about a new or highly technical subject.
- When only a professional discipline is qualified to judge whether a criterion is met.

Appendix A8 - Expert opinion

Six steps in audit design

- Clarifying audit project objectives
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When to seek expert opinion

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- When only a professional discipline is qualified to judge whether a criterion is met.

Expert opinions can be sought individually. Or experts can be consulted interactively in a way that allows them to discuss and modify their initial opinions in consultation with other experts.

It is imperative to be clear about exactly what the expert is to do. If you require a written, signed opinion that can be quoted at Public Accounts Committee (PAC) or in the chapter, the cost will be higher than for a less formal or oral opinion. But its value as evidence will also be higher.

Example

Expert opinion is used in many audits in the planning phase for defining potential issues, and in the examination phase as support for findings. But the source of the opinion is not always credited directly in the report.

One audit that credited expert advice directly was the 1991 chapter on Quality in the Constructed Project, dealing with the Department of Public Works. This pilot audit examined two general purpose office buildings to assess whether the government got what it paid for, as defined by the project requirements and specifications, building regulations and its own declared policies. The methodology for assessing construction quality was developed for the audit team by the Institute for Research in Construction of the National Research Council, which is recognized as the leading authority in this field in Canada. In this case, because the experts were public servants, there was little cost to the Office for their services. Then the quality was assessed by practising professionals from the private sector (on contract), and their technical reports were reviewed by the experts from NRC.

Both buildings examined were found generally to be designed and constructed to commercial standards commonly in effect at the time. However, deficiencies were found in fire safety, exterior construction, heating systems, air quality, lighting, acoustics, and access for the handicapped. The findings attracted a lot of media attention. If, as our main evidence, we had relied solely on the technical reports of the private sector professionals, without the methodology and the quality control by the NRC, the findings would not have had the same credibility.

Strengths and weaknesses

In some situations the opinion of an expert may be the only source of evidence available, and it would be particularly useful when a lot of judgment must be applied to assess whether a criterion has been met. There are, however, several dangers:

- In the example above, the experts not only had credibility but also developed strict procedures that required other reputable professionals to carry out detailed work to arrive at the judgments used as evidence. If an audit were to rely on a professional's off-the cuff judgment, the credibility of the evidence and perhaps its value would be much lower.

- It is best to obtain the services of experts who have a proven record of success in their field, recognized by their peers. Expert opinion may not be persuasive when there are two or more well known differences of opinion (such as whether there is global warming). It would be best to avoid a "my expert versus your expert" argument at PAC because the result would probably be inconclusive. In addition, in the example above, the Department agreed with the choice of expert and although this is not essential, it helps.

- If the auditor wants to state statistically valid conclusions, it may not be possible to obtain the services of enough individual experts.
- If the findings of several experts are to be summarized, it may be necessary to assign weights to or "scale" the results, because the individuals are unlikely to be equally knowledgeable about the subject area. This adds to the cost, the risks and the subjectivity of the results.

Sources of further information

Rossi P.H. and H.E. Freeman, Evaluation: *A Systematic Approach,* 2nd edition, Sage Publications, Newbury Park, 1989.

Linstone, H.A., and M. Turoff: *the Delphi Method - Techniques and Applications*. Reading, Mass: Addison-Wesley Publishing Company, 1975.

Appendix A9 - Reviewing and using the results other studies and audits

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

The bureaucracy is a rich source of studies, often unpublished, such as consultants' reports, internal audits, and evaluations. It makes sense for auditors working on the same issues to mine this material before spending a lot of time on original research and, wherever possible, to use rather than repeat existing work. Sometimes this may be difficult. Many potential audit issues have a long history. Learning of the existence of prior studies and finding them may not be easy. And often when they are located their methodology or scope may make them unsuitable as evidence. But usually the search repays the effort.

In the planning phase of an audit it is important to know whether the organization being audited has already identified and perhaps dealt with matters that could be of significance to Parliament. This can be learned by seeking out past studies, reviewing them, and asking what happened as a result. Possible criteria may also be found.

If an issue or some of the evidence in a prior study is worth reporting to Parliament, it can be validated in the examination phase using reliance procedures, e.g., by examining the working papers or interviewing the authors. Even if not used as evidence, reviewing what went wrong with past studies can help improve our own examination design and, later, give the auditor a more realistic perspective in developing potential recommendations for improvement.

What is involved in reviewing and using the results of other studies and audits?

There are several aspects to consider in gathering and using evidence from secondary sources: learning the best places to look; sifting through sources to determine whether anything is of use; and, finally, checking their accuracy before placing reliance upon them. We are talking here mainly about the first part of the process rather than the latter; i.e., gathering and sifting secondary information. To first locate and then sift through applicable studies, auditors can use literature searches and content analysis, among other techniques. At the earliest stages of an audit, references to important studies can often be found in management committee minutes, in a breakdown of contract or consulting budgets, or in central file lists.

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When to review and use the results of other studies and audits

- In planning any audit, to identify criteria and/or check out potential matters of significance.
- In the examination phase, to support issues (as long as the evidence is validated before it is reported).

Examples

The 1991 Annual Report chapter 10 dealt with the farm safety net programs administered by the Department of Agriculture. At the time of the audit, the programs included Crop Insurance, the National Tripartite Stabilization Program, payments under the Agricultural Stabilization Act and the Western Grain Stabilization Act, and various ad hoc programs such as the Special Canadian Grains Programs and the Canadian Crop Drought Assistance Program. The support to Canadian agriculture represented by these programs amounted to a total of some $7.6 billion over the five-year period from 1986-87 to 1990-91.

The audit objective was to identify the range of effectiveness issues that it would be reasonable and appropriate to expect the Department to address in evaluating its safety net programs.

To achieve this goal, 150 technical papers were referenced in preparing an analysis of the evaluation measurements used by the Department. The documents encompassed articles in learned journals and professional publications, technical books, special studies undertaken by private sector "think tanks," etc. They originated in the United States, Canada, the European Economic Community, and international bodies such as the Organization for Economic Co-operation and Development.

From the information that it was possible to develop on evaluation questions and issues, the range of possible effects (positive and negative) identified by the content analysis was compared with evaluation studies undertaken by the Department in the course of its evaluation cycle. The perspective clearly identified a number of key effects where additional analysis and measurement would greatly expand the understanding of the impacts of program activities of this type. As a result, the Department's Evaluation Division indicated that it was expanding future evaluation measurement work on these programs to examine program effects in the following areas:

- contribution of the programs to maintaining the agricultural resource base;
- the extent to which regular ongoing safety net provisions may be counteracting distortions in market prices due to other governments' policies in international trade;

When to review and use the results of other studies and audits

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- contribution of the programs to maintaining the agricultural resource base;
- the extent to which regular ongoing safety net provisions may be counteracting distortions in market prices due to other governments' policies in international trade;

- the extent to which ad hoc financial support in response to trade wars can contribute to resolving international negotiations in this area; and

- the possibility that, as designed, the programs may be contributing to over-production and excess capacity in the agricultural sector.

Most audits draw upon some previous work, and other corroborating studies are often cited in the annual Report. For example, Exhibit 17.3 of the 1990 chapter on Energy, Mines and Resources cites two studies of the cost of producing maps. The paragraph 8.53 of the 1992 chapter on Search and Rescue refers to a program evaluation that indicated the costs of providing certain types of rescue vessels exceeded the benefits they provided. Another study was also referred to that noted that these vessels were not critical to saving any lives over a five year period.

A variant of this approach is to join forces with another organization in a joint audit, where each partner is permitted to use the results of the other's work. Two recent examples of this are: the 1993 chapters on Merchandise Trade Statistics and Non-insured Health Benefits. The first was carried out jointly with the GAO; the latter with internal audit. The scope and methodology for the work to be done by the partner was agreed in advance, and this greatly simplified the later decisions about reliance.

Strengths, weaknesses and cautions

As with all written material, beware of taking evidence from another study out of context. Cardinal Richelieu is reputed to have said: "Give me six sentences from an innocent man, and I'll have enough to hang him."

In general, the strengths and weaknesses can most easily be discussed for each of the main types of secondary data:

Internal audits and evaluations - when they exist for the area/subject audited, they are often very useful, and are ignored at the auditor's peril. The general approaches and processes followed by internal audit and evaluation, and thus the amount of effort to devote to them, will likely be known to the audit team in advance. To assess validity, the auditor can usually see working papers or talk to those who did the work.

Consultants' reports - a very mixed source. Some follow clear and defensible methodologies. Others, often those with the most intriguing titles, may be hard to find, and may have very limited or unclear terms of reference and unknown standards of work.

The quality of work may be hard to determine because consultant reports do not always include the evidence to support conclusions. Working papers may not be available, and the level of client involvement may not be discernible either.

Special internal task forces and studies - also a very mixed source that must be approached with caution. They are more likely to be useful for problem definition than for evidence. Sometimes internal studies are dignified with titles or importance that the quality or amount of work does not deserve. Evidence for conclusions is often anecdotal. Credentials of those involved are sometimes unclear.

Studies from other jurisdictions (provinces, universities, think tanks, private sector). If these are in the public domain, it should be possible to uncover them and to get some independent judgment of their quality; otherwise it could be extremely difficult to locate and assess them.

Sources of further information

Stewart, D.W. *Secondary Research: Information Sources and Methods,* Sage Publications, Newbury Park, 1984.

A more advanced approach to the analysis of secondary data is what the GAO calls "The Evaluation Synthesis", which examines and formally weighs the results from many studies, even some with conflicting findings, to come up with an overall conclusion.

Appendix B: Tool kit of techniques for information analysis

1. Program logic models
2. Making comparisons using ratios
3. Interpreting data distributions
4. Regression analysis
5. Benefit-cost analysis
6. Simulation and modelling
7. Content analysis of qualitative data
8. Work flow and communications flow analysis

These appendices can help you decide when but not how to use the audit techniques. Contact the appropriate FRL or seek expert advice before trying something complicated.

Appendix B1 - Program logic models

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
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The Program Logic Model (PLM) is an analytic tool best used in the audit overview and survey. It displays the logical flow of program design, from the mandate given by legislative direction to the expected results intended to achieve the will of Parliament. PLMs are particularly useful in results-oriented auditing, as they focus attention on program outcomes in relation to mandate and objectives. They serve the auditor's need to achieve program understanding efficiently and to communicate that understanding to an audit advisory committee.

What is a program logic model

A program logic model is a schematic representation of the raison d'être for a program, the programmatic translation of that legislative direction and the articulation of the likely results of the expenditure of resources. PLMs serve results-based auditing because they give particular attention to outputs and outcomes (impacts and effects), with the presumed linkages to each other and to the legislative direction served by the program's objectives.

Each of the key parts of a PLM, with brief explanations, is presented in Exhibit B1 together with a schematic diagram of the relationship of the parts.

The form of logic model presented here emphasizes legislative direction, program operations, and results both intended and unintended. Legislative direction, which sets out a program's mandate, is an important consideration for legislative auditors who are concerned with an entity's accountability to its governing body. Program operations are given more importance in this model than typically in the models of evaluators because (1) as auditors we are often concerned with the systems put in place by the entity and (2) concerns with operational efficiency and program performance will be centred on the operation of the program. Finally, the model gives explicit recognition of unintended as well as intended program results, because the audit of effectiveness measurement is concerned with the net results of a program, the negative as well as the positive.

The PLM in Exhibit B1 is one approach to the audit task of understanding the entity. Other variants of program models exist, with somewhat similar names.

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When to use program logic models

- **In the planning phase, to help understand the audit entity and to help identify key program results and the program systems and operations that produce them.**

Example

Because an audit report focusses on findings more than on initial program understanding, it is rare for an annual report chapter to present a full PLM. A recent example, and one that the Public Accounts Committee found useful, is the diagram presented in Exhibit 9.3 of our 1992 Report. The information summarized in Exhibit B1 is taken from several locations within Chapter 9. Exhibit B1 displays very briefly the type of information called for by the various parts of a logic model. For audit use, however, a PLM will typically require several pages of text and diagrams to present properly the key parts of the modelled program, its core systems and procedures, the rationale linking the various levels of results and the relevance of the results to the program mandate and objectives.

Strengths and weaknesses

The key strength of a PLM is the guidance it provides for developing an understanding of the program to be audited. It forces attention to all of the key elements of a program from the perspective of legislative audit. Available information is brought together to form a whole, and any missing information is highlighted. Experience as shown that entities provide most information about program and process, least about expected program outcomes and tend to ignore potential negative effects.

Strengths

A PLM provides direction to the efficient search for program understanding. It offers a concise format for the recording of the key elements of the target program. For the VFM auditor, it emphasizes the full range of program results and serves as an aid in the search for results-oriented matters of potential significance. Because it presents the logic that links the program mandate to the program results, it provides a basis for a cause-and-effect analysis of effectiveness.

Effectiveness measurement includes measurements both ongoing (directed at efficiency of performance) and periodic (centred on program relevance, success and cost-effectiveness) measurements. The program logic model provides for both. Efficiency focusses on inputs, outputs and the rate at which inputs are used to produce or deliver goods and services. The centre portion of the PLM recognizes the need for information about this dimension of program performance. An Effectiveness focusses on the results end of the model and asks if the program impacts and effects are, on balance, a success story, whether they are relevant to the legislative

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Because an audit report focusses on findings more than on initial program understanding, it is rare for an annual report chapter to present a full PLM. A recent example, and one that the Public Accounts Committee found useful, is the diagram presented in Exhibit 9.3 of our 1992 Report. The information summarized in Exhibit B1 is taken from several locations within Chapter 9. Exhibit B1 displays very briefly the type of information called for by the various parts of a logic model. For audit use, however, a PLM will typically require several pages of text and diagrams to present properly the key parts of the modelled program, its core systems and procedures, the rationale linking the various levels of results and the relevance of the results to the program mandate and objectives.

Strengths and weaknesses

The key strength of a PLM is the guidance it provides for developing an understanding of the program to be audited. It forces attention to all of the key elements of a program from the perspective of legislative audit. Available information is brought together to form a whole, and any missing information is highlighted. Experience as shown that entities provide most information about program and process, least about expected program outcomes and tend to ignore potential negative effects.

Strengths

A PLM provides direction to the efficient search for program understanding. It offers a concise format for the recording of the key elements of the target program. For the VFM auditor, it emphasizes the full range of program results and serves as an aid in the search for results-oriented matters of potential significance. Because it presents the logic that links the program mandate to the program results, it provides a basis for a cause-and-effect analysis of effectiveness.

Effectiveness measurement includes measurements both ongoing (directed at efficiency of performance) and periodic (centred on program relevance, success and cost-effectiveness) measurements. The program logic model provides for both. Efficiency focusses on inputs, outputs and the rate at which inputs are used to produce or deliver goods and services. The centre portion of the PLM recognizes the need for information about this dimension of program performance. An Effectiveness focusses on the results end of the model and asks if the program impacts and effects are, on balance, a success story, whether they are relevant to the legislative direction, and whether the current program is the most efficient way to achieve the results. A well-formed PLM displays all of the program elements necessary to audit efficiency and effectiveness.

Limitations

The program logic model does not assist in all Office responsibilities. For example, it does not assist the attest audit or the audit of fraud and illegal activity. It is of relatively little value to systems-based auditing.

Sources of further information

ARTD Software, *Program Logic: An Introduction for Public Service Managers*, Melbourne, Australia, 1992. Available at the OAG Self-Learning Centre. A self-instructional program designed to show how analyzing a program's logic can be useful in focusing on the key aspects of a program and for the development of MOPS.

Halpern, Gerald, *Program Model For Evaluating Government Interventions*, Paper delivered at the American Evaluation Association, Dallas, Texas, 1993.

Rush, Brian and Ogborne, Alan, *Program Logic Models: Expanding Their Role and Structure for Program Planning and Evaluation*, In Canadian Journal of Program Evaluation, Volume 6, Number 2, 1991, Pp 95-106.

Exhibit B1 – Parts of a program logic model

(Examples from the 1992 Report chapter "Employment - Monitoring Performance Against Expectations", are shown in italics)

Legislative direction (mandate)	The mandate as given by Parliament. Generally found in an Act, often presented in broad general terms. *Unemployment Insurance Act and the Labour Force Development Strategy (LFDS).*
Objectives and program policy	The translation of the mandate into well formed objectives (purpose, resources, responsibility, specificity) and program instruments designed to achieve the objectives. *"To promote the efficient and effective functioning of the Canadian labour market" via the following mechanisms: facilitated decision making, improved employability, encouragement of employer training, and help to communities to develop employment.*
Inputs	Resources (e.g., human, financial, equipment, material, facilities, information, energy, land) which are to be transformed by the program instruments into outputs. *The LFDS offers a wide range of instruments grouped into four program activities, each oriented to a different class of objectives, namely:* *Information & special initiatives $ 14 million* *Employability adjustment $930 million* *Labour market adjustment $121 million* *Community development $357 million*
Program operations	The planning, organization and implementation of program operations designed to efficiently produce outputs appropriate to the objectives and without negative results. Control refers to the comparison of actual performances (internal to and output from operations) with norms or standards and the taking of corrective action when the variance exceeds designed tolerance.
Results	The collection of outputs and outcomes (impacts and effects) associated with a program.
Outputs	The products (goods and services) of a process within program operations (serving internal clients) and/or the goods and services of a program intended to serve external clients. Outputs are largely under the control of program managers and, very frequently, are expected to lead to particular outcomes. *The four mechanisms named in program policy, with their associated resource levels, are expected to produce outputs such as, respectively: job advertising, research on new approaches, and statistics; training programs for workers; training programs offered by employers; and the formation of community councils.*
Outcomes	Program outcomes are downstream effects of the program outputs. They are, typically, expected to be of a nature that satisfies the program mandate. *For the Employment Program, the intended impacts are: use of labour market information by employers and employees; enhanced labour market skills; improved range and level of skills of in-house labour; and restructured economic bases of communities. The effects of these impacts are expected to be a more efficient labour market, a more effective labour*

market, and lowered unemployment rates.
However, the outcomes are influenced by factors other than the program as well as by the program outputs. This may result in unintended effects and/or undesirable outcomes. These outcome possibilities are illustrated in the following table.

	Intended	**Unintended**
Impacts	Positive results of outputs on their recipients. Often stated as an expected outcome by program objectives. *For example: unemployment insurance is intended to provide income to tide workers over periods of cyclical unemployment.*	*A negative example: marginal workers may become dependent on UI. A positive example: worker gains time in which to find new employment.*
Effects	Secondary positive results from the impacts. May be stated as expected outcome by program objectives. *For example: maintaining the unemployed worker's income helps prevent the community economy from collapsing because UI recipients can still continue to patronize community businesses.*	A negative *example: the availability of UI may hinder structural labour force adjustment. A positive example: a critical population is maintained in a town until new industry can be attracted or developed.*

Appendix B2 - Making comparisons using ratios

Six steps in audit design

- **Clarifying audit project objectives**
- **Formulating researchable questions/criteria**
- **Determining what data will answer the questions**
- **Identifying appropriate sources/types of data**
- **Planning the collection of data**
- **Planning the analysis of data**

There are three main "ratio expressions", each of which communicates essentially the same information: proportions [6:12], percentages [50%], and decimals [0.5]. Their purpose is to compare one quantity with another. Such comparisons include parts compared with a whole, two items compared, or changes in an item compared with an original state.

Numerical comparisons are common in all phases of audit work. As both an analytical and a communication tool, ratios are a simple and powerful way to compare actual states with what is expected.

The basic concept of ratios is universally understood, and they are used frequently in many contexts. However, their power should not be underestimated with familiarity. Often a sophisticated audit analysis can be summed up in a simple ratio.

The use of ratios in vfm audits

Ratios are often used as the first level of quantification in an audit. For example, the general audit criterion might be "The department should accurately assess applications for payment." To apply this criterion, the auditor needs to establish the percentage of errors that would establish that applications had not been "accurately assessed". He or she would then develop an audit test, which would probably involve sampling an appropriate percentage of applications to ascertain accuracy.

Ratios place a number in a context that makes its significance apparent. For example, the auditor might observe that the entity experienced 500 cases of absenteeism last month. However, the significance of that number is hidden until it is compared with the expected number of absenteeisms. Whether the expected number is 5000 or 50 will determine what the audit finding is.

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When to make comparisons using ratios

- To compare actual with expected values.
- To place a finding in context.
- To observe a change over time.
- To note the degree to which a criterion is met.

When the auditor wishes to observe that an amount has increased or decreased by some proportion, he or she uses a percentage expressed as a proportion of the original amount. For example, if absenteeism increases from 500 to 600 cases, then the percentage increase is 100/500 percent or 20 percent. Similarly, if it increases to 1500 (three times as large as the original amount), then it has increased by 200 percent.

In audits, ratios are based on the "population at risk". For example, the auditor does not observe that 5 percent of payments were made by incorrectly dated cheques if only 10 percent of all payments were by cheque (the rest being electronic transfers). In this case, he or she observes that 50 percent of all cheques written were incorrectly dated. Similarly, care is taken to ensure that groups that are compared through ratios are legitimately comparable. For example, the auditor would state that an entity's absentee rate is twice the national norm for government departments only when that department is comparable in relevant respects to other departments.

As well, ratios are used with care when the base is small. For example, if only two payments out of 6000 were made by cheque, and one was incorrectly dated, the auditor would not report that 50 percent of cheques were incorrectly dated without mentioning that there were only two cheques written. Similarly, when the base is zero, the auditor would not calculate a percentage increase at all. For example, if the cheque dating errors change from zero one month to 7 the next, the increase in percentage terms is not 100 percent, but rather is infinite [$7/0 = \infty$].

Audit ratios generally are used only when the base amount and the increment are both "anchored at zero". For example, if one organization makes 10 more cheque date errors than the norm and another makes 5 more, the first organization is not necessarily twice as error-prone as the second. If the norm is 100 errors, the first organization is, in fact, approximately 4.7 percent more error prone than the second. [110-105/105].

Audit ratios often take into account changes in the base over time. In general, when a ratio is calculated, either the base (denominator) is fixed or its rate of change is known and taken into account. For example, if the internal audit division of an entity is auditing 20 percent of existing programs each year, and the entity is adding one new program each year, then it will take ten years (not five) before all programs are audited.

When a ratio is used, the base or denominator is always in the same unit of measurement as the increment or numerator. For example, audit observations of changes in dollar values generally are adjusted for changes in the value of the dollar unit itself, if the latter is significant. If expenditures rise from $100 to $150 over a period of three years, the auditor would state that they have increased by 50 percent only if inflation has not significantly eroded the value of the

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Advantages and disadvantages of using ratios

The main advantages of ratios are pertinence and clarity. They support the auditor's basic interest in comparing actual values with expected values. They are clear, familiar and easy to calculate.

The main disadvantages arise from misuse or irrelevant use. Ratios can be irrelevant if no audit point is made and, because of the legitimate expectations of the reader that a ratio has significance, auditors generally do not use a ratio solely for descriptive purposes. A ratio is not raw data but interpreted information. As well, despite the familiarity and ease of calculation of ratios, it is possible to make mistakes in their calculation and interpretation.

A quality checklist for citing ratios

When a ratio is cited, the following criteria generally should be satisfied:

- The ratio should make or support a point.
- The base (original number or amount) should be noted.
- The percentage increase or proportion should be calculated correctly.
- The "population at risk" should be properly identified.
- The size of the base should be adequate to support the comparison.
- The base should be anchored at zero.
- Relevant changes in the base over time should be taken into account.
- The units of the numerator and denominator should be the same.
- It should be clear whether changes are annual, cumulative, or other.

Sources of further information

Anderson, S. et al, *Statistical Methods for Comparative Studies*, John Wiley and Sons, New York, 1980.

Maier, M.H., *The Data Game*, M.E. Sharpe Inc., New York, 1991.

GAO/PEMD - 10.1.11 - Quantitative Data Analysis : An Introduction, 1992.

CICA, *Using Ratios and Graphics in Financial Statement Reporting*, Research Report, Toronto, 1993.

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Appendix B3 - Interpreting data distributions

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

What are data distributions?

A data distribution generally is expressed by a graph (bar-chart or curve) that shows all the values of a variable. The statistics that describe data distributions can be powerful tools for audit analysis and reporting. There are three basic dimensions of a data distribution that may be important to an audit observation:

- The **level of the data** (mode, median, mean, quartile levels, etc.);
- The **spread of the data** (minimum and maximum values, clumpiness, tails, etc); and
- The **shape of the data** (normal distribution, flat distribution, bi-modal distribution, etc.).

The auditor might examine a data distribution to understand some characteristic of the entity, or to compare actual values with expected values where more than single numbers are involved. For example, if a government program has a mandate to assist "low income" Canadians, the VFM auditor might examine the distribution of incomes among recipients of assistance to see whether their incomes conform to this criterion.

Examining data distributions is often more informative than focussing on a single figure (an "average", for example). Single-figure estimates easily can lose much of the richness of the information available to the auditor. As well, in reporting, single-figure observations may communicate an impression of greater precision and confidence in the finding than is warranted, if the figure is an extreme (an "outlier") or if the variability (uncertainty) of the data is not acknowledged. This is particularly important when the auditor is reporting departmental estimates to Parliament, and needs to put them in the context of the auditor's own analysis of the likely range of the value being estimated.

In general, examining data distributions is useful when:

- the auditor wishes to assess whether performance has met a criterion (for example, if there are variations in the error rate in processing cheques from month to month, the auditor needs to judge whether a particular figure is within the usual variation).
- the auditor needs to interpret probability distributions to assess risk (for example, how does a particular loan loss provision compare with the distribution of possible default outcomes?)
- the auditor is working with sampled data and needs to assess whether the sample is representative of the population. When the auditor is dealing with sample data, the calculation of these measures is more complex because of sampling error and the consequent limits that must be placed on confidence in the estimates.

**When to examine
data distributions**

- To identify the level, spread or shape of the data when this is more important than a single "average" number.
- To decide whether a variable performance meets an audit criterion or not.
- To interpret probability distributions to assess risk.
- To assess whether sample data one representative of the population.

The use of data distributions in audit

Data levels

The average level (sometimes called the "central tendency") of a data set can be expressed in a number of ways, including the mean (arithmetic average), the mode (most common value), or the median (the middle value, in the sense of having an equal number of data values above and below).

Each of these measures has its own strengths and weaknesses. For example, the most common of the three (the "common average" or "mean") is a fully acceptable measure only if the data distribution has one peak with data distributed reasonably symmetrically around that single peak. The auditor would not compare the "averages" of two groups unless this condition existed.

Among statistical analysts, an increasingly common and useful way of expressing the level of a data set is called a "stem and leaf" diagram. Such a diagram conveys the range, the median or middle level, and the inter-quartile range (distance from first to third quartile, encompassing the middle half of the data) in a compact graphic manner. Auditors can use such graphic tools in

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Data spreads

The "spread" of the data is the range from the minimum to the maximum value. For example, if the frequency of committee meetings is between 3 times per year and 37 times per year, then the spread is 3 to 37. However, if one of these values is unusual (an "outlier") then the real spread of the data might not be captured well by this observation. In such a situation, the auditor could use the interquartile range as a better measure of spread.

Another approach to dealing with outliers is to truncate the spread. If, for example, all data values fall between 3 and 7 with the exception of one unusual value at 37, the finding can be expressed by stating the exception and noting the truncated spread. Auditors should be careful to understand the level and shape of the data distribution before making a decision about what sort of truncation, if any, might be justifiable.

Awkward data that are difficult to make sense of can occasionally be analyzed better by transforming them into another form. For example, it is not uncommon for there to be a simple relationship between the logarithmic forms of two variables (which can be easily drawn as a line or a curve on a graph) where there is no such simple relationship between the ordinary numeric forms of the variables. The auditor might be able to predict expected values better by correlating the logarithmic forms of two variables than by trying to relate the ordinary numeric forms of the variables.

Data shapes

Graphing the distribution of data (with bar charts or curves) can be a useful examination tool, and, in some circumstances, an effective reporting device. Distributions can tell a great deal about the phenomenon being examined. Some standard distributions, such as the "normal" or the "poison" distribution, have been studied extensively and, if the data conform to one of the standard distribution types, one immediately knows a great deal about the probabilities of various data values occurring. Such a distribution can provide a benchmark against which actual observations can be judged.

There are now computer programs available, such as "BestFit", that automatically calculate the distribution to which the data best conform - a great help to the auditor beginning the examination of a variable.

Data distributions are on a smooth continuous scale or a discontinuous one. Distributions along discontinuous scales are used with great care in the reporting phase of an audit. To the casual eye they can be taken to be continuous smooth distributions when they are not.

Sources of further information

John E. Freund, *Modern Elementary Statistics*, Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1973.

Richard Jaegar, *Statistics - A Spectator Sport,* Sage Publications, 1990.

Dennis G. Haack, *Statistical Literacy: A Guide to Interpretation*, Duxbury Press, 1979.

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Appendix B4 - Regression analysis

Six steps in audit design

- **Clarifying audit project objectives**
- **Formulating researchable questions/criteria**
- **Determining what data will answer the questions**
- **Identifying appropriate sources/types of data**
- **Planning the collection of data**
- **Planning the analysis of data**

Regression analysis is a technique for assessing the degree to which variables are associated (correlated). It is a common and important analytical technique, underlying several types of analysis in finance, management and public policy. The auditor may encounter it by different names for essentially similar techniques. For example, economists talk of "simultaneous equations" (the basis of macroeconomic models, for example), sociologists use "path analysis" to explain cause and effect, and other management scientists use "causal analysis". All of these analytical approaches use regression analysis.

Regression analysis can be used to test a relationship that is supposed to hold true, to identify relationships among variables that may be causally related that might explain outcomes, to identify unusual cases that stand out from expected values, or to make predictions about values in the future. As well, the technique can be used to build "models" of the operations of an audit entity's programs and projects. Specifically, an audit team might use regression analysis to:

- *Test a relationship that is supposed to hold true*

For example, the Department of Agriculture has, in the past, administered programs whereby farmers received grants and contributions in proportion to either the previous year's crop or the current year's crop, or for some other measure for which statistical data is available. In such a situation the auditor might select a sample of recipient farmers and undertake field visits to test whether the granting criteria had been met. Alternatively, or as a preliminary test, the auditor could use regression analysis to ascertain whether crop levels by district correlated with total grant payments in the way one would expect if the granting criteria had been respected.

- *Identify unusual values or "outliers" that do not fit the regular relationship between two things*

When one instance stands out from the normal pattern of association between two variables, such as "number of staff" and "total payroll", the auditor may have identified a deficiency and is prompted to do more specific tests to find the reason for the anomaly.

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- *Make predictions or projections for the future based on an observed relationship that has held in the past*

For example, the auditor might examine the relationship between the demand for loans and the rate of growth in the general economy, as one aspect of assessing loan-loss provisions.

When to use regression analysis

- **To test a relationship that is supposed to hold true (when statistical data is available).**
- **To identify unusual values or "outliers" that do not fit the regular relationship between two things.**
- To make predictions or projections for the future based on an observed relationship that has held in the past.
- To build models of entity operations.

- *Build models of entity operations*

It is worth reiterating that, in general, the partial correlations normally found in audit analysis are not, in themselves alone, sufficient substantiation for audit findings but need to be supported by other evidence if the findings are to withstand challenge.

What is regression analysis?

The simplest form of regression analysis is frequently referred to as correlation analysis. It examines the correlation between two variables, "X" and "Y" (that is, the degree to which changes in one are associated with changes in the other). Such variables might be, for example, "length of service" and "rank" in the armed forces. The auditor might gather data about these two variables from thirty armed forces throughout the world, giving thirty sets of data pairs [X_1Y_1, X_2Y_2, ... $X_{30}Y_{30}$]. She or he then analyzes whether there is a relationship between the two variables by finding the line that best fits the observed data, and seeing how well it fits. Ideally, all of the data pairs would fall on the line when plotted on a graph. The "line of best fit" is that which most nearly approximates of ideal, and there are various statistical measures of how well a proposed regression line describes the data.

This two-variable regression analysis can be extended to encompass many explanatory variables influencing one "dependent" variable. This type of analysis is called multiple or multi-variate regression analysis.

Regression analysis is normally preceded by less sophisticated exploratory methods, such as cross-tabulations, scatter plots of data, and back-of-the-envelope fitting of "regression" lines to the data.

- *Make predictions or projections for the future based on an observed relationship that has held in the past*

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When to use regression analysis

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What is regression analysis?

The simplest form of regression analysis is frequently referred to as correlation analysis. It examines the correlation between two variables, "X" and "Y" (that is, the degree to which changes in one are associated with changes in the other). Such variables might be, for example, "length of service" and "rank" in the armed forces. The auditor might gather data about these two variables from thirty armed forces throughout the world, giving thirty sets of data pairs [X_1Y_1, X_2Y_2, ... $X_{30}Y_{30}$]. She or he then analyzes whether there is a relationship between the two variables by finding the line that best fits the observed data, and seeing how well it fits. Ideally, all of the data pairs would fall on the line when plotted on a graph. The "line of best fit" is that which most nearly approximates of ideal, and there are various statistical measures of how well a proposed regression line describes the data.

This two-variable regression analysis can be extended to encompass many explanatory variables influencing one "dependent" variable. This type of analysis is called multiple or multi-variate regression analysis.

Regression analysis is normally preceded by less sophisticated exploratory methods, such as cross-tabulations, scatter plots of data, and back-of-the-envelope fitting of "regression" lines to the data.

Audit resources required to use regression analysis

Most microcomputer spreadsheet software includes a regression sub-routine. However, to avoid the "garbage-in/garbage-out" syndrome, it is often worthwhile to have experts in both the subject matter and regression analysis contribute to the team effort.

Example

In 1993, the Office reported on a government-wide audit of the operation of program evaluation units. The audit assessed the implementation, products and use of program evaluation. A large amount of information was collected on evaluation infrastructure, management and results, including the resourcing of program evaluation units, reporting relationships, degree of senior management involvement, use of long range planning, etc. Information was also gathered on the results of the function, including the number of program evaluation reports produced and cost-savings and program improvements generated by studies.

Multiple regression analysis was used to assess the relationship between the characteristics of program evaluation units and the results of program evaluation activities. The analyses were complex and time consuming. A technical expert was brought in to assist in the analyses, which took over a month to complete. For regression analysis to be reliable, the date must meet certain statistical requirements and statistical tests had to be conducted on the data beforehand to ensure that the requirements were met. In the end, some analysis could not be conducted because of the small (42) number of cases available and other statistical requirements. Significant statistical knowledge was needed to make judgements regarding the reasonableness of analysis and to find solutions to technical problems that arose.

The analyses made an important contribution to the reporting of the audit. Regression analysis contributed to the identification of program evaluation units that represented best practices and to the reporting of specific recommendations for improvements to the management of program evaluation. Paragraphs 9.75, 9.76 and 9.77 reported the results of the analysis, concluding that the use of evaluations increased with senior management involvement. Thus the Chapter recommended in paragraph 9.90 that Deputy heads should be involved in approving and ensuring the use of multi-year evaluation plans, monitoring the implementation of evaluation recommendations and following up on corrective action.

The regression analyses facilitated clearance because it was an objective and accepted means of sorting out the relationships among numerous potentially important factors and because it permitted the presentation of anonymous aggregate findings rather than deficiencies in individual departments.

Strengths and weaknesses

The main strength of regression analysis in an audit is in the examination phase. It can be a powerful technique of data analysis that, used accurately and well, can inform the auditor about important issues.

However, it has limited potential as a reporting technique. Its technicality, and abstruse terminology, are difficult to explain to an audience unfamiliar with statistical analysis.

Another important weakness of regression analysis is its susceptibility to the garbage-in/garbage-out syndrome. A computer will construct a regression equation from almost any data. However, unless the variables in the equation have been deliberately (and correctly) specified beforehand, the equation will be meaningless. Moreover, poor use of the technique may be difficult to detect without detailed reanalysis.

Even where the regression analysis is done correctly, correlation is often misinterpreted to imply causation where there is none. Even where correlation is high it does not necessarily imply causality. For example, two variables may both be caused by a third (daily temperature and number of farm loans might be correlated, for example, because both tend to occur in the summer; but this does not mean that a hotter week will produce more farm loans). Another common misinterpretation of regression equations is in the "direction" of causation. For example, the auditor might find that "absenteeism" and "total work defects" are correlated and conclude that absenteeism causes work defects when, in fact, the stress of work failures is causing increased absenteeism.

That is, regression analysis works best when the variables are numeric (for example, "dollars" or "miles"). Regression analysis can be adapted to cope with categorical variables such as "male/female" or "Canadian/non-Canadian" to a limited extent. However, when the auditor is working with categorical variables it is often preferable to move to another technique.

Quality checklist for regression analysis

- How adequate are the data on which the forecasting model is based? Is it a relevant, large, coherent and consistent data set?
- How valid are the *a priori* assumptions? Are the underlying causality assumptions plausible? Are the values of the parameters reasonable?
- Are the components and level of aggregation of the model appropriate to the problem at hand? For example, an "energy production model" for Alberta can tell us nothing about the effects of taxes on production unless taxes are an integrated component of the model.
- Is the scope of the model too wide or narrow? How many variables and trends does it attempt to encompass?
- Did the analyst identify a causal or predictive model before running the data through the computer program, or simply dump in data and allow the computer to go on a fishing expedition for apparently significant relationships?
- Did the analysis include plausible tests of the robustness of the linear model? In particular, did the analyst develop and calibrate the model on one data set, and test its predictive power on another data set? If not, does the model in fact stand up well when applied to new data?

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Appendix B5 - Benefit-Cost Analysis

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

The purpose of benefit-cost analysis is to determine whether the benefits of an entity, program or project exceed its costs. For auditors, this is a central value-for-money issue which should guide the enquiry in both the survey and examination phases. Establishing value for money is primarily the responsibility of management. Sometimes, however, the auditor may seek assurance that the analysis has been done to professional standards. At other times the auditor may wish to compare costs and benefits directly.

Managers and analysts have long compared benefits and costs to make decisions. However, the formal technique called benefit-cost analysis dates only from the late 1950s and early 1960s. It was developed initially by water resource economists to assess the value for money of investments in dams and other large water diversion projects. Its successful application in this field led to its wide use by economists and financial analysts in business, the military and agencies such as the World Bank, where it remains the central technique for value-for-money appraisal of investments.

At the same time as the benefit-cost framework was being fully developed, social scientists were making strides in their ability to measure and value in dollars various economic, social and environmental costs and benefits that previously had been treated as essentially qualitative. The ability to be more precise about such inputs to the benefit-cost framework increased the framework's usefulness to government.

What is Benefit-cost analysis?

There are two components to benefit-cost analysis: the benefit-cost analysis framework which was developed mainly in a financial context, and the measurement of some benefits and costs that are inputs into that framework, many of which have been developed in the non-financial social sciences.

When to use benefit-cost analysis

- To obtain assurance that an analysis done by the audit entity meets professional standards.
- To compare costs and benefits when both are know or can reasonably be estimated.
- To compare costs of alternatives when benefits can be assumed constant.

The benefit-cost framework is closely related to financial analysis, which auditors undertake routinely. It involves adjusting dollar values to standard units (adjusting for inflation and for time preference), considering risk and uncertainty, and assessing the outcome in terms of its "net present value" or "internal rate of return".

The inputs into that framework, in contrast, sometimes are unfamiliar to the auditor when they include relatively esoteric measurements of benefits and costs. The improvements in measurement that made the inclusion of such items possible contributed to the development of "social" benefit-cost analysis. This typically requires that two difficult measurements be made:

- *The identification and quantification of the "incremental" effects of an entity, program or project.* The true effects of government actions often are difficult to identify and measure. For example, a farm subsidy program may coincide with expanded farm acreage, but how much of the expansion is due to the program and how much to other coincidental factors might be difficult to ascertain.

- *Monetization of the effects.* Expressing the values of costs and benefits in dollars may require specialized expertise, since some costs and benefits are difficult to quantify (aesthetic benefits or costs, for example) and some are quantifiable but difficult to express in dollar values (a number of injuries avoided, for example).

The outcome of many benefit-cost analyses is determined by the size of the discount rate, and this poses a particular problem for the auditor. The Department of Finance and Treasury Board have estimated that the appropriate discount rate is approximately 10 percent after inflation adjustments. However, several entities have used lower discount rates. The result is that capital appears to be "cheaper" than in the private sector, and some projects whose value-for-money may be dubious are approved.

Benefit-cost analysis is not a single technique. It is a group of techniques that generate, and then synthesize, cost and benefit data. Some of the analytical techniques that are often part of a benefit-cost analysis include:

- using "opportunity cost concepts" to measure costs, benefits and parameters such as the discount rate;

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benefit-cost analysis**

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- using "opportunity cost concepts" to measure costs, benefits and parameters such as the discount rate;

- basing benefit and cost values on "willingness-to-pay" research;
- adjusting market prices to "social prices" because of distortions in the economy resulting from such things as monopolies, regulation, and taxes;
- discounting "cash flows" to summarize benefits and costs into a single figure such as a net present value or a rate of return; and
- undertaking sensitivity analysis and risk analysis to examine the effect that uncertainties about the data have on the judgment of value for money. In risk analysis, instead of using single-figure estimates of benefits and costs, the auditor estimates a range (minimum to maximum) of each value and probabilities within those ranges. With the help of simulation techniques, this allows the auditor to estimate the riskiness (uncertainty) of the value for money of the project, program or entity being examined.

Use of benefit-cost analysis in audits

Detailed measurement of social and economic costs and benefits generally is beyond the scope of OAG audits. If attempted, such analysis requires an interdisciplinary approach and specialist assistance from an economist or other social scientist specializing in the methodology. Technical issues to be addressed include the following:

- how to identify the "incremental" costs and benefits, as compared with those that are in some way associated with the project or program but would have occurred anyway;
- how to quantify and monetize benefits or costs that are incommensurable and intangible;
- what discount rate to use and how to treat inflation; and
- how to combine cost-benefit analysis with risk analysis.

The Office of the Auditor General encounters benefit-cost analysis in three main ways:

- review of the quality of benefit-cost analyses undertaken by the audit entity;
- audit teams, in both financial and value-for-money audits, sometimes compare costs and benefits when these are readily obtainable in a usable form; and
- audit teams sometimes undertake partial benefit-cost analyses, especially when costs of alternatives are available in dollars and benefits can be assumed constant.

Examples

Review of the quality of benefit-cost analyses. Departments and agencies undertake benefit-cost analysis fairly frequently, partly because they are required by the Treasury Board

"Guidelines to Part III of the Estimates" to present such an analysis to justify each major funding request. Therefore, major Crown projects normally are subject to benefit-cost analysis, especially when they involve significant grants and incentives to the private sector. In addition, some agencies, such as the National Energy Board of Canada, have routinely based their regulatory decisions on benefit-cost analysis. Several departments and agencies, including Treasury Board, Industry, Transport, and Public Works and Government Services, have produced manuals or guides to using the technique.

The Auditor General has recommended that the benefit-cost analyses undertaken by departments and agencies of the Government of Canada be more rigorous. For example, the Auditor General criticized one department for using an inappropriately low discount rate in its benefit-cost analysis of a major Crown project. At a 5 percent discount rate the net present value of the project was a large positive number, whereas at the 10 percent discount rate (recommended by Treasury Board and the Department of Finance) the net present value was a large negative number. Only the positive figure was presented in the Part III, without noting either the discount rate used or the fact that another discount rate gave a very different result.

Another example is in paragraph 6.32 of the 1991 chapter on "Capital Projects - Quality in the Constructed Project", which recommends that "... proper life-cycle cost analyses [should be] prepared, as called for in the Treasury Board Administrative Policy Manual, before any significant investments are undertaken." As background to this recommendation, the audit working papers reported some examples of life-cycle cost analysis performed by the audit team to establish the materiality of the matter.

Benefit-cost analysis when the inputs are readily available. In some cases, audits have found that information on costs and benefits is readily available, but the department or agency either has not analyzed it well or has not presented the analysis correctly. In these cases, a results-oriented approach to auditing can lead the audit team to undertake its own benefit-cost analysis to demonstrate the significance and materiality of the lack of analysis. For example, one department spent large sums gathering data about the results of a resource enhancement program, and had information readily available on the costs of various enhancement facilities, but had not analyzed the relationship between the two. A small effort by the audit team, assisted by a specialist in benefit-cost analysis, was useful in establishing the positive value for money of some facilities and the lack of value in others.

Partial benefit-cost analysis. In some cases, benefits reasonably can be regarded as fixed, and only costs analyzed. For example, the procurement of a standard product or item can be compared in several different entities. Simple cost comparisons can establish whether value for money was obtained or not. This technique of least-cost analysis is sometimes called cost-effectiveness analysis.

The Office of the Auditor General has used this technique frequently. For example, the 1991 Report chapter "Vehicle Fleet Management" reported a test by which the audit team "assessed the prices of bulk-buy vehicles purchased by DSS by taking a sample of vehicles and comparing the prices paid to the maximum prices that fleet management companies would pay for the same vehicles." One finding was that about a quarter of the civilian vehicles purchased were priced within 4 percent of the maximum price, identifying a potential issue of lack of economy.

Similarly, the OAG audit of military colleges in 1990 questioned why civilian community colleges were not used for vocational training, on the assumption that the training provided was essentially equivalent. This type of analysis is sometimes extended by some quantification of the intangible benefits, as in the 1994 audit of DND Personnel Married Quarters, which attempts to assess benefits such as improved morale or improved retention of personnel.

Strengths and weaknesses

Benefit-cost analysis offers techniques whereby even costs and benefits that are difficult to measure or monetize can be brought into a value-for-money equation.

On the other hand, full benefit-cost analysis often requires sophisticated adjustments of the measures of costs and benefits, on the basis of uncertain assumptions. This can make managers and parliamentarians uneasy. It is often suspected, sometimes fairly, that such assumptions and adjustments are fertile ground for manipulation of the result of the analysis if the analyst has a hidden bias.

It is also true that accurate cost and benefit identification is often difficult because government departments and agencies do not keep records of costs and benefits in a way that allows them to be directly compared. For example, the 1992 Report compares the costs of maintaining a battalion in the regular army and in the reserves, but only by making multiple assumptions because National Defence was unable to provide full and accurate costing of each kind of battalion. The cost records for most programs typically cut across many activities and are organized for administrative convenience, not for VFM analysis.

The technique of partial benefit-cost analysis (least-cost analysis) has several other limitations. First, it is not uncommon for the measurement of costs to be as complex as the measurement of benefits, for example, where costs are environmental, social, or related to health and safety. Therefore, focussing on costs alone might not simplify the measurement task much. Compared with benefit measurement, some costs pose equally difficult identification, quantification and valuation problems.

Second, the auditor's assumption in this type of analysis that the "benefits" are constant is open to challenge in the more important cases. This challenge is likely to be successful if the item in question is complex and/or peculiar to the technical mission of the department or agency. In such cases, the audit entity generally has more credibility than the audit team in judging what things offer comparable benefits and can, if it wishes, use this credibility, to challenge the audit findings. For example, in 1992, one audit team was able to establish a large cost differential between a major made-in-Canada item and similar items purchasable off-the-shelf from foreign manufacturers. However, although the findings proved sustainable when applied to small standard items, the potential finding on the major item was not pursued because it was unlikely to be sustained against the audit entity's assertion that the "comparables" offered significantly different benefits in return for the cost differences. The audit team cannot refute such a response short of a full benefit-cost analysis.

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Appendix B6 - Simulation and modelling

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Simulation uses a mathematical model, together with input data, to "mimic" a "real life" system and to predict the response of that system to changes. Occasionally, the auditor will construct a simulation model (when doing risk analysis, for example); but more often the auditor encounters simulations that the audit entity has conducted, and has to assess their validity and reliability in the examination phase.

The distinction is not great between the ability to do simulations and the ability to assess simulations conducted by the audit entity. If the auditor needs to challenge the results of the simulations conducted by the audit entity, he or she has to be able to redo the simulation, perhaps using somewhat different assumptions in the mathematical model to see whether deficiencies in the existing model are material.

Simulation and modelling might be key to estimating costs or benefits of a project or program, and might therefore be central to judgments about value for money. Almost any type of "real world" situation can be simulated. For example, the federal government conducted a vaccination program against "swine flu", based on epidemiological simulations of what would occur if an epidemic of swine flu were to break out. In fact, there was no significant outbreak of this strain of influenza in North America. However, this does not mean that the decision to vaccinate was necessarily uneconomical. This program's value for money would depend on the worth of the simulations that initially provided the probabilities of epidemic losses.

What is a simulation?

A simulation has three main components: input data, a mathematical model, and output data. There are two main types of mathematical models used in simulations: *stochastic models,* which incorporate a random data generator; and *deterministic models,* which do not.

In some ways, simulation resembles other statistical techniques such as regression analysis and, in fact, these techniques may be used to build the model. Once the model is constructed, however, it treats its inputs as data to be acted on by the model rather than as information on which to base the model.

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The mathematical model generates output data that can be checked against actual outcomes in the real world. Generally, the output data from a simulation are treated like data collected by any other method. They do not speak alone but must be explored, analyzed and summarized.

When to use simulation and modelling

- To assess the adequacy of models the audit entity uses to make important decisions.
- To answer "what if?" questions about the impact of audit issues, observations or recommendations.

There are many situations in which government agencies might use simulations as a basis for financial decisions that, in turn, might be examined by the auditor as a key part of a VFM audit. For example, at one time the federal government informed universities that funding from the research councils would be that of the previous year plus a "matching grant" equal to the sum committed by the private sector to the university for research. The Ministry of State for Science and Technology commissioned a simulation of the government's expected financial liabilities under this new scheme. Another common type of simulation is the macroeconomic model, which attempts to mimic the behaviour of the whole economy or some sector of the economy.

Models and simulations come in all sizes and complexities. Many are as simple as a single spreadsheet, perhaps with a "monte carlo" add-on to produce output data. On the other hand, some models that the auditor might be called upon to understand, and use, can be very complex and might require an expertise in mathematics that the general auditor does not have. In such a case, specialist advice needs to be available to the audit team.

Examples

In the annual financial audit of a federal lending agency, the auditors found that the agency's "loan-loss provisions" were based on a "risk model" that simulated the probable losses from various types of loans in the agency's portfolio. The auditor's judgment about the appropriateness of the loan loss provision hinged on an assessment of the reliability of this risk model's prediction of probable losses.

Another type of simulation model that the auditor may encounter is a risk model based on an investment spreadsheet. When the inputs to the investment analysis are given as ranges and probabilities (rather than as single certain figures), a risk model produces range and probability information about the bottom line (normally the net present value). This information on range and probability can be very useful to a manager seeking to assess the risks of an investment, or to an auditor estimating materiality and risk.

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Strengths and weaknesses

As a means of gathering audit information, simulation potentially offers several advantages. They arise from its quickness, its ability to provide "what if" analysis under alternative scenarios, and its relatively low cost compared with field observations by auditors in person.

However, simulations are prone to technical problems. One is that difficulties have been discovered in the random number generators built into some simulation software. It is worth ensuring that the random number generator in the software used by the audit team satisfies a criterion known as the "spectral test". Another problem is that correlated input variables, if not managed properly in the analysis, can lead to extreme results that are not representative of reality.

A simulation is only as strong as its technical components. The input data and the mathematical model can have problems, and the results of a simulation are always subject to assumptions that can be challenged. Therefore, it is not a technique that lends itself to definitive audit findings, nor is it generally a useful reporting tool. However, it can be a powerful examination tool, especially when combined with other audit methods of data collection and analysis.

Quality checklist for simulations

A "quality checklist" for simulations might include these questions:

- Are the input data valid and reliable measures of what they purport to measure?
- Is there an underlying *a priori* model that is credible, or is the model simply a result of a "data fishing" exercise?
- Have the input data been analyzed and explored for possible outliers and gross errors?
- Have any important aspects been omitted from the model?
- What changes in the real world situation would invalidate the model?
- Have the output data been analyzed in detail?
- Are the results reasonable?
- If new programming has been involved in setting up the model, has it been checked and verified?
- Are the sources of random numbers known to be defective?
- Is the model robust? That is, does it predict accurately when applied to new sets of data that were not used in building the model?

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- Is the model robust? That is, does it predict accurately when applied to new sets of data that were not used in building the model?

Sources of further information

R.A. Wilson, "Management Accounting, Modelling and Forecasting", *Management Accounting*, London, Vol. 69, Oct. 1991, p.38-39.

W. Rees and C. Sutcliffe, "Mathematical Modelling and Stochastic Simulation of Accounting Alternatives", *Journal of Business Finance and Accounting*, Vol. 20, April 1993, p.351-358.

M. Greenberg et al, *Models in the Policy Process: Public Decision Making in the Computer Era*, New York, Russell Sage, 1976.

Appendix B7 - Content analysis of qualitative data

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

Content analysis is a systematic approach to collecting and organizing information in a standardized format. It allows analysts to arrive at general conclusions and general observations, based on detailed data in a variety of written and other recorded material.

In the context of a value-for-money audit, auditors often are confronted with large quantities of documents - files, reports, technical studies, parliamentary committee transcripts, etc - which contain valuable data that could provide useful and informative answers to issues and matters of potential significance raised by the audits. Content analysis can be very useful during the planning and re-examination phases to summarize, provide audit evidence and even transform it into significant audit findings.

What is content analysis?

Essentially, content analysis stems from a very straightforward question: how can we make sense of existing data that, because they come from a variety of sources and were developed for different purposes, often appear incoherent and full of gaps and overlaps when considered together?

To provide an objective answer to this question and to ensure the replicability and credibility of the resulting analysis, it is essential to delineate clear and systematic procedures.

Therefore, it is suggested that auditors intending to use content analysis follow these steps:

- Deciding to use content analysis (when to stop the case-by-case review of new material and start to analyze it systematically).

- Determining what material should be included in content analysis. For example, to help identify program objectives it could include legislation, regulations, Hansard, transcripts of parliamentary committees, program policy documents, Part IIIs, transcripts of interviews with officials.

- Selecting units of analysis.

- Developing coding categories.
- Coding the material.
- Analyzing and interpreting of the results.

When to use content analysis

During the planning phase:

- To help identify the program objectives: To do this the auditor may gather information on the program's legislative history.
- To describe program activities: Content analysis can be used to provide an objective description of the program's activities by analyzing departmental documentation.

During the examination phase:

- To determine positive or negative program results: Content analysis can be used to synthesize evaluation reports, audit reports, policy papers, academic or independent assessments of program performance, etc. Summarizing the conclusions reached by these various studies can provide a powerful assessment of the impacts and effects of a given program.

The suggested reading section below refers to documents that contain detailed explanations of the significance, scope and methodological considerations pertaining to content analysis.

Example

The 1993 Annual Report chapter 9 dealt with the operation of program evaluation units in departments. The audit objective was to assess the implementation, products and use of program evaluation in departments and the progress made since 1983 (when the previous government-wide audit of the program evaluation function had been undertaken).

As part of the assessment of evaluation products, a content analysis approach was used to determine which basic evaluation issues had been addressed by program evaluations (either in their terms of reference or in their conclusions or recommendations.) The units of analysis were

- Developing coding categories.
- Coding the material.
- Analyzing and interpreting of the results.

When to use content analysis

During the planning phase:

- **To help identify the program objectives: To do this the auditor may gather information on the program's legislative history.**
- **To describe program activities: Content analysis can be used to provide an objective description of the program's activities by analyzing departmental documentation.**

During the examination phase:

- **To determine positive or negative program results: Content analysis can be used to synthesize evaluation reports, audit reports, policy papers, academic or independent assessments of program performance, etc. Summarizing the conclusions reached by these various studies can provide a powerful assessment of the impacts and effects of a given program.**

The suggested reading section below refers to documents that contain detailed explanations of the significance, scope and methodological considerations pertaining to content analysis.

Example

The 1993 Annual Report chapter 9 dealt with the operation of program evaluation units in departments. The audit objective was to assess the implementation, products and use of program evaluation in departments and the progress made since 1983 (when the previous government-wide audit of the program evaluation function had been undertaken).

As part of the assessment of evaluation products, a content analysis approach was used to determine which basic evaluation issues had been addressed by program evaluations (either in their terms of reference or in their conclusions or recommendations.) The units of analysis were the program evaluations completed from 1985-86 to 1991-92 and the coding categories were based on the basic evaluation issues defined in the 1991 Program Evaluation Policy:

- Relevance (Does the program make sense?)
- Success (Has the program achieved what was expected?)
- Cost-effectiveness (Are there better ways of achieving the results?)

Another type of issues not specifically mentioned in the Policy (namely operational issues, i.e., issues addressing the suitability and efficiency of the program's day-to-day operations, rather than the program's results) was also coded.

Each of the 610 program evaluations completed from 1985-86 to 1991-92 were reviewed and coded by two auditors. The codes were entered on a coding form and the two auditors discussed their individual codings to reach an agreement on the final codes to be assigned. The coding forms were provided to the client departments who were asked if they agreed. Where the department disagreed, a third auditor was brought in to review the coding and reach agreement with the department.

It was determined that the issue of program success was the one most likely to be addressed and that operational issues are a major focus of program evaluations.

These results were compared to a similar content analysis conducted in 1983. Three quarters of the studies examined in 1983 addressed program relevance while the same departments addressed this issue in just over half of the studies they completed from 1985-86 to 1991-92.

These findings led to the conclusions that evaluations are primarily directed at serving the interests of deputy heads and senior departmental officials instead of accountability purposes. Chapter 9 recommended that deputy heads "should ensure that evaluations address the more significant departmental issues, as well as government priority areas, in a timely manner."

Strengths and weaknesses

Content analysis has several advantages. Where it provides corroboration from information drawn from a variety of sources, it can lend to a high degree of reliability findings. Also, it can cope with large volumes of written material and help analysts learn about the substantive area. Finally, it can be used to validate other methods.

However, content analysis also has a number of disadvantages that, although not invalidating this approach, should be considered before a decision is made to use it:

It can be costly: Even though content analysis does not require the collection of new data - a notoriously expensive and time-consuming proposition - three potential contributions to prohibitive cost must be taken into account:

- Formulating categories that can be reliably coded is sometimes problematic, repetitive, and time-consuming. It almost always involves going back and rereading some documents a second time.
- Staff have to train coders if they intend to analyze more data than they can handle themselves. Preparing a coding manual and training and supervising the coders can be very time-consuming.
- Coding substantial amounts of written material can be tedious and may result in coding errors, resulting in a need for quality control.

In certain contexts, it can pose validity problems: Content analysis has limitations inherent in any data collection activity. Reliability and validity are interdependent concepts. Generally, trade-offs have to be made between them because precisely defined categories can produce results that are highly reliable and statistically significant but that lack practical significance to the audit at hand. The need for objective and replicable results may force analysts to forego coding what they are interested in and to code what can be done mechanically, thus reducing validity.

Sources of further information

Genest, Yves, Content Analysis: An Audit Technique to Assess Documentary Evidence, Office of the Auditor General of Canada, 1994.

United States General Accounting Office, Content Analysis: A Methodology for Structuring and Analyzing Written Material, Washington D.C., March 1989.

Appendix B8 - Work flow and communications flow analysis

Six steps in audit design

- Clarifying audit project objectives
- Formulating researchable questions/criteria
- Determining what data will answer the questions
- Identifying appropriate sources/types of data
- Planning the collection of data
- Planning the analysis of data

One way to analyze the activities of an organization is to chart where, when, or how decisions are made or information or materials are sent from one unit or person to another. Complex procedures or heavy "traffic" can often be modelled or depicted graphically in a way that will help in the analysis of why the work is done the way it is.

Flow charts are frequently used in attest audits and in the planning phase of VFM audits. They are used occasionally in the examination and reporting phases as well.

By drawing a flow chart, the observer gains a better understanding of what actually goes on in an organization. The graphic format helps to pinpoint problems as well as opportunities for improvement.

Different types of charts can be used for different purposes. For example, an internal control chart can show the controls built into a system and can help to identify weak points in the chain. A process chart can show steps in processing, transporting and storing a product or delivering a service, and can help to pick out gaps, duplications, bottlenecks and delays. Or a communications flow chart can show the volume and types of contact one department or organizational unit has with others, and thus help to analyze any need for improvements in reporting relationships, communications, or perhaps even floor layouts.

In the examination phase, special purpose charts can help develop audit findings about, for example, efficiency, financial management or information technology.

What is work flow and communications flow analysis?

Flow charts are like models. They come in all shapes and sizes, depending on the purpose and the level of detail needed. Typically, the auditor takes information from interviews, personal observation or existing documentation and creates a chart using symbols to represent the various decision points or activities being analyzed (like creating, comparing or filing documents). The finished chart would be verified by a "walk through" with those directly involved.

M121

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Example

In Exhibit 28.1 of the 1990 Report chapter on the Department of the Secretary of State - Citizenship Program, there is a flow chart of the steps in processing an application for citizenship. This formed the basis for recommendations later in the chapter (paragraphs 34 - 67) to improve the operational efficiency and effectiveness of the process.

When to use work flow and communications flow analysis

- **To gain an understanding of how an organization or system works, particularly when the subject of the audit involves many departments, units, or complicated steps.**

Flow charts are frequently used to analyze and depict complicated organization relationships.

Strengths and weaknesses

The main advantage of flow charting is that it creates a depth of understanding and a clear picture of how processes work. It might be particularly useful in the audit of a government program responsible for processing large volumes of information or materiel, such as applications for grants or contributions.

A disadvantage is that it may lead the auditor into a level of detail more appropriate to internal audit or other entity staff (such as those specializing in work simplification or systems and procedures analysis). Charting is primarily a "systems-based audit" tool and not usually appropriate for high-level "program" issues. However, once the audit has decided that a particular program result is important, then a flow chart can help to identify roadblocks on the way to allowing it but once started on flow charting, it is easy to get bogged down and to lose sight of the bigger picture.

Even though flow charts often provide considerable detail, they inevitably create a simplified picture. Like the use of photographs or case studies, the subjects must be carefully chosen to show typical or significant situations.

Sources of further information

Tufte, Edward, *The Visual Display of Quantitative Information*, Graphics Press, Cheshire, Connecticut, 1990.

Martin, J. and McClure, C., *Diagramming Techniques for Analysts and Programmers*, Prentice Hall, 1985.

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